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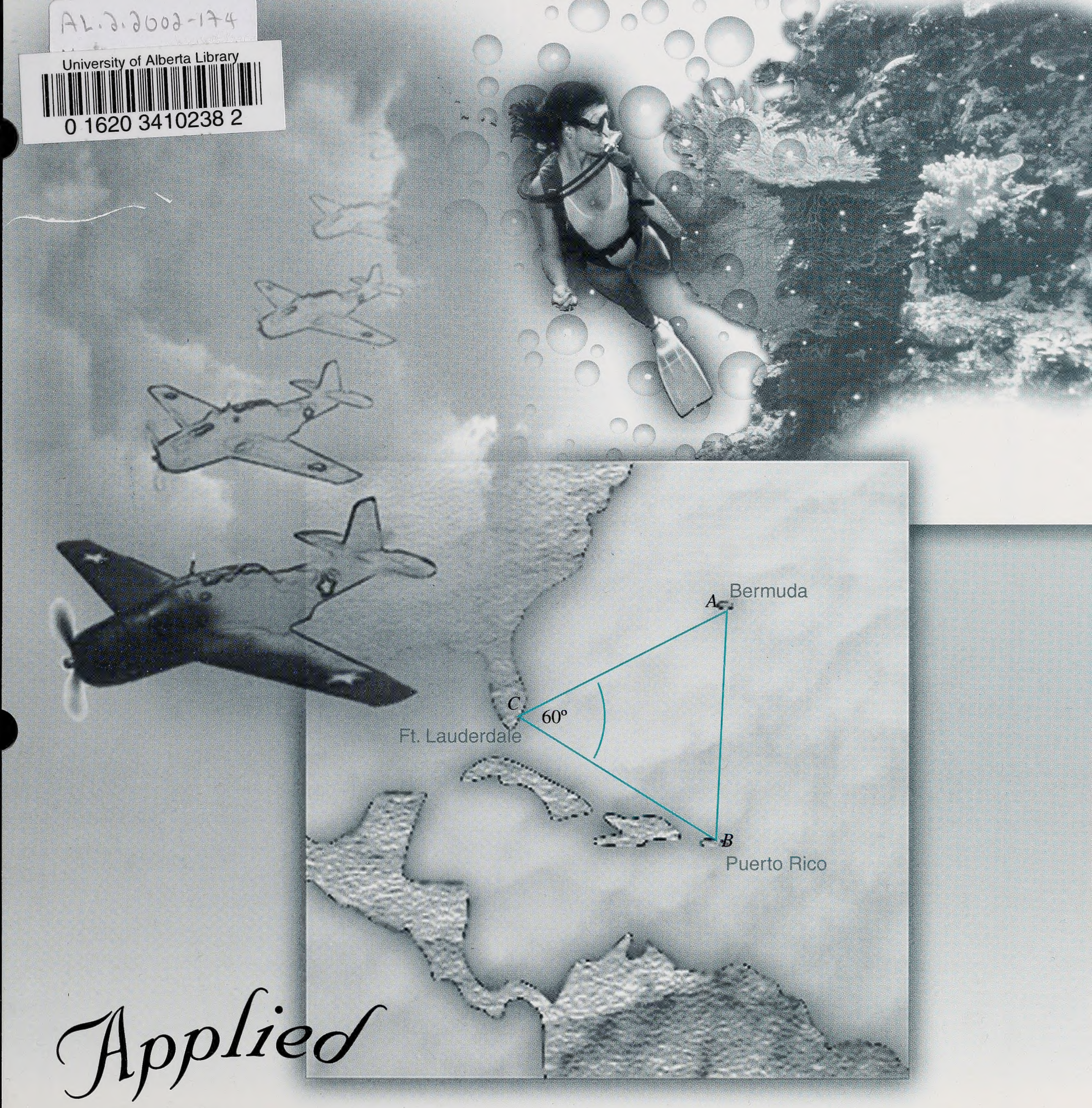

Applied Mathematics 10

TEACHER'S GUIDE

Learning
Technologies
Branch

Alberta
LEARNING

Applied Mathematics 10

TEACHER'S GUIDE

Learning
Technologies
Branch

Alberta
LEARNING

NOTE: This Applied Mathematics 10 Teacher's Guide contains the Final Test and answers to the Final Test and to the teacher-assessed assignments; therefore, teachers should at all times keep it secure against unauthorized student access. The Final Test should be accessible to students only in supervised situations.

Applied Mathematics 10
Modules 1–7
Teacher's Guide
Learning Technologies Branch
ISBN 0-7741-1609-9

This document is intended for	
Students	
Teachers	✓
Administrators	
Parents	
General Public	
Other	

You may find the following Internet sites useful:

- Alberta Learning, **http://www.learning.gov.ab.ca**
- Learning Technologies Branch, **http://www.learning.gov.ab.ca/ltb**
- Learning Resources Distributing Centre, **http://www.learning.gov.ab.ca/lrdc**

The use of the Internet is optional. Exploring the electronic information superhighway can be educational and entertaining. However, be aware that these computer networks are not censored. Students may unintentionally or purposely find articles on the Internet that may be offensive or inappropriate. As well, the sources of information are not always cited and the content may not be accurate. Therefore, students may wish to confirm facts with a second source.

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Teachers

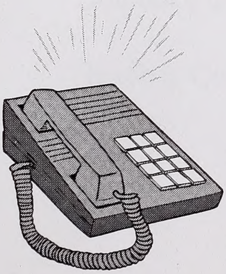
Register with the Learning Technologies Branch

The Learning Technologies Branch is dedicated to upgrading and continually improving your Teacher's Guide so that the guide accurately reflects any necessary revisions we have had to make in a Student Module Booklet, Assignment Booklet, Project Booklet, or the sample Final Test. The types of revisions that will be made are those that make the course more accurate, more current, or more effective.

LTB will send you the **latest enhancements** or **minor upgrades** for your Teacher's Guide if you register with us. To do so, please fill out the registration portion of this page and send this page to: Learning Technologies Branch, Box 4000, Barrhead, Alberta T7N 1P4, Attention: Instructional Design and Development.

LTB Teacher's Guide Registration Form

First Name	Surname
School Name	School Phone Number
School Address	
City	Postal Code
Course Title	Approximate Date of Purchase



You can help ensure that distance learning courseware is of top quality by letting us know of areas that need to be adjusted. Call the Learning Technologies Branch—free of charge by dialling first 310-0000, then 674-5350—and ask for the Editing Unit. Also, a teacher questionnaire has been included at the back of most Teacher's Guides. Please take a moment to fill it out and send it in.

We look forward to hearing from you!

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Introduction

A survey of these course materials will confirm that this learning package has been specially designed for many kinds of teachers working in a variety of situations.

In Which Category Do You Fit?

☐ Small Schools Teacher

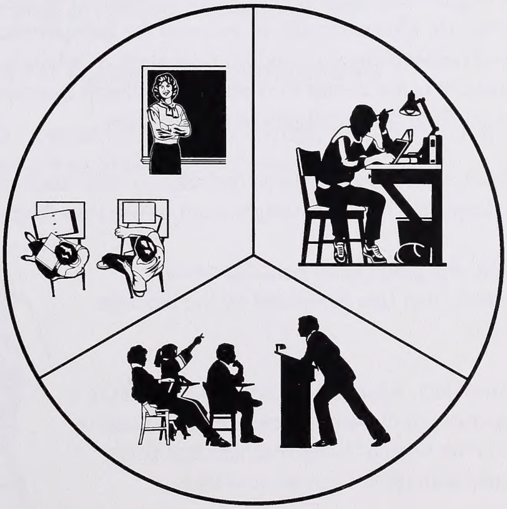
  ☐ inexperienced
  ☐ experienced, but in other subject areas
  ☐ experienced in teaching Applied Mathematics 10, but wanting to try a different approach

☐ Distance Learning Teacher

  ☐ travelling to schools within the region
  ☐ using facsimile and teleconferences to teach students within the region

☐ Large Schools Teacher

  ☐ inexperienced
  ☐ experienced in teaching Applied Mathematics 10, but wanting to try a different approach



Because these materials have been created by experienced classroom teachers and distance learning specialists, they have many advantages for students and teachers, regardless of the situation.

Advantages for Students

Materials

- incorporate a strong learner-centred philosophy
- promote such qualities in the learner as autonomy, independence, and flexibility
- are developed through media that suit the needs and circumstances of the learner
- reflect the experiential background of Alberta students
- provide opportunities by overcoming barriers that result from geographical location
- promote individualized learning, allowing learners to work at their own pace

Advantages for Teachers

Materials

- allow teachers maximum teaching time and minimize preparation time
- include different routes through the materials to suit different learners
- incorporate a wide range of teaching strategies, in particular those using independent and individual learning
- deliver curriculum designed by education specialists that reflects the Alberta Learning Program of Studies with an emphasis on Canadian content
- provide learning materials that are upwardly compatible with advanced educational technology

Does this learning package sound like something you could use?

This Teacher's Guide begins with an overview of the current Alberta Learning Program of Studies for Applied Mathematics 10. This summary is included for inexperienced teachers or those teachers who have found themselves teaching Applied Mathematics 10 when their training is in other subject areas. This brief description is not meant to replace the Alberta Learning Program of Studies, but rather to help teachers confirm the highlights of the program.

Other parts of this introduction have also been included to help teachers become familiar with this learning package and determine how they might want to use it in their classrooms.

Beyond the introduction, the guide itself contains answers, models, explanations, and other tips generated by the teachers who authored this course.

The Student Module Booklets, Assignment Booklets, and TGs are the products of experienced classroom teachers and distance learning specialists. It is the hope of these teachers that their experience can be shared with those who want to take advantage of it.

Overview of the Program of Studies

The distance learning materials for Applied Mathematics 10 reflect the beliefs, goals, and expected student outcomes of the document *The Common Curriculum Framework for K–12 Mathematics Grade 10 to Grade 12: Western Canadian Protocol for Collaboration in Basic Education,* 1996. This document provides the basis for the programs of study in Alberta, British Columbia, Manitoba, Saskatchewan, the Northwest Territories, and the Yukon.

In Alberta, there are three mathematics programs of study that include twelve courses: Applied Mathematics 10–20–30, Applied Mathematics 10b–20b, Pure Mathematics 10–20–30, Pure Mathematics 10b–20b, and Mathematics 14–24.

Each mathematics program is designed for students with different mathematical strengths and interests.

- Pure Mathematics 10–20–30 is intended for students who are strong in algebra and mathematical theory.
- Applied Mathematics 10–20–30 is better suited to students who prefer to solve problems using numerical reasoning or geometry.
- Mathematics 14–24 is a general mathematics program for high school students who have experienced difficulties in previous mathematics courses.

Each sequence of courses is designed for students with different post-secondary and career plans.

You may find it helpful to read mathematics updates on Alberta Learning's website.

http://www.learning.gov.ab.ca/studentprograms

The Prerequisite for Applied Mathematics 10

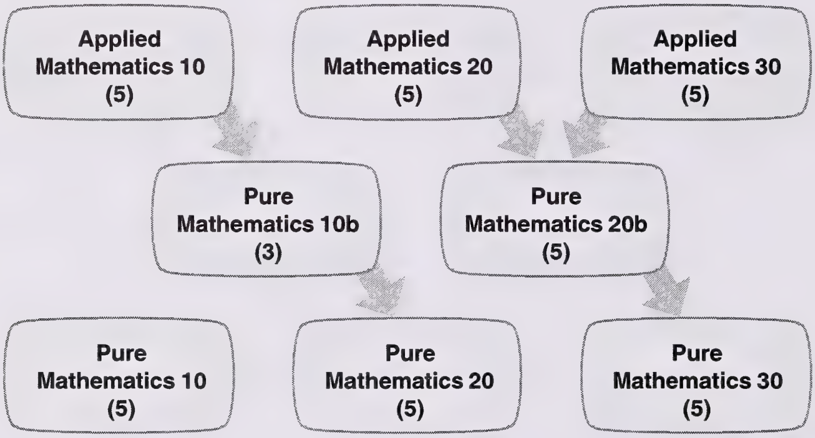
Students enrolling in Applied Mathematics 10 must have successfully completed the program of studies for Mathematics 9 or Mathematics Preparation 10.

Transferring from Applied Mathematics to Pure Mathematics

Students, for a variety of reasons, may want to transfer from the applied mathematics course sequence to the pure mathematics course sequence. The outcomes that are common to pure mathematics and applied mathematics need not be repeated.

Students who want to transfer after meeting the acceptable standard in Applied Mathematics 10, may take Pure Mathematics 10b, a three-credit course. However, students may opt to complete the entire Pure Mathematics 10 course and earn five credits. Students who want to transfer after meeting the acceptable standard in Applied Mathematics 20 or Applied Mathematics 30 may take Applied Mathematics 20b, a five-credit course.

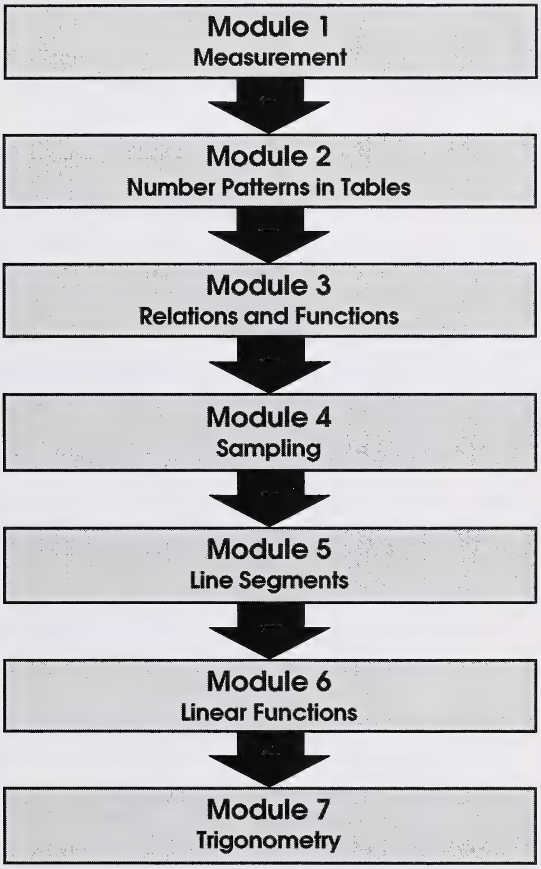
The two bridging courses are shown in the following diagram:



Overview of Applied Mathematics 10

Applied Mathematics 10 contains seven modules. Because of the sequential nature of the course, the modules should be approached in order.

Applied Mathematics 10



The Applied Mathematics 10 course emphasizes numerical reasoning, measurement, and geometry. Real-life problems are introduced to demonstrate the applications of theory and procedures. Students are expected to communicate effectively, explain, illustrate, reason, and make connections. Multiple-solution strategies to problems and problem contexts will be expected as students work through both routine and non-routine problems.

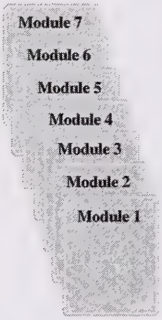
Every attempt has been made to give students a variety of activities and to make mathematics real and interesting. The graphing calculator, the computer, and the Internet are integrated to cater to learning styles of individual students.

Structure of the Learning Package

Basic Design

This learning package involves many other components in addition to the Teacher's Guide. A survey of the components will show you that the course is divided into clumps of learning called modules. For each module there are three print components: a Student Module Booklet, an Assignment Booklet, and a Project Booklet.

Student Module Booklets



Student Module Booklets contain guided activities that instruct students in a relevant, realistic setting.

These booklets have been specially designed to promote such qualities in the learner as autonomy, independence, and flexibility. Writers have incorporated such teaching strategies as working from the concrete to the abstract, linking the old to the new, getting students actively involved, and using advance, intermediate, and post organizers. Many other techniques are used to cater to individual learning styles and preferences. The materials have been designed to include a variety of pathways and options because they are intended for a broad range of use within and beyond Alberta.

Contents
Overview Evaluation
Beginning the Module Project
Activity 1 Activity 2 etc.
Completing the Module Project Submit the Module Project.
Module Summary Submit the Module Assignment.
Appendix

The structure of the Student Module Booklets follows a systematic design. Each booklet begins with a detailed table of contents that shows the students all of the main steps; this page acts as an organizer for students. The Module Overview introduces the module topic or theme and includes a graphic representation to help visual learners and poor readers. This introduction also includes an evaluation statement, so students are informed of the weightings of each assignment.

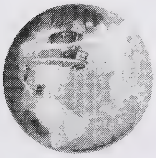
The body of the Student Module Booklet introduces a module project. Then there are several activities that develop the related skills and knowledge. The activities may include print, audio, video, computer, or Internet involvement. Internet activities are optional. At times, the student and the teacher are allowed to choose the activity that best suits the student's needs and interests. Each Student Module Booklet also includes other activities such as the Extra Help and Enrichment as optional pathways. This flexibility caters to each student's personal situation. The activities and Follow-up Activities prepare the student for completing and submitting the module project.

Following the last section is a modular summary that focuses on the skills and strategies that the student has learned. The Student Module Booklet ends with an Appendix that includes a Glossary and Suggested Answers for the self-assessment work.

Project Booklet and Assignment Booklet

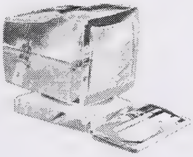
Accompanying each Student Module Booklet is a Project Booklet and an Assignment Booklet. The activities in the Project Booklet and Assignment Booklet can be used for both formative and summative assessments. Students should complete these projects and assignments when they have thoroughly reviewed the other module materials. The Project Booklets and Assignment Booklets have been designed for both in-classroom use and for distance learning.

Media



INTERNET

CD



COMPUTER

Internet references are found throughout the course; exploring those references, however, is optional for students. In most cases, students are given suggested topics that they may explore through the Internet's search engines. In rare cases, students might be given a specific uniform resource locator (URL), but they should be aware that these addresses are subject to change.

Updated information about the Learning Technologies Branch and this course and others can be found by starting at the Learning Technologies Branch's home page at

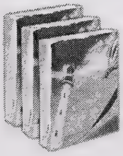
http://www.learning.gov.ab.ca/ltb/

or by going straight to the LTB Courses page at

http://www.learning.gov.ab.ca/ltb/400/courses.html

There are activities in this course that require students to use a spreadsheet program. There are also activities that direct students to the companion CD (this CD comes with the course), to *Geometer's Sketchpad®* or similar investigative geometry software (optional), and to an optional videocassette. If you want students to have access to the optional software and video, arrangements should be made to ensure they are available when students need them. More information about the software and videocassette appears on the next page.

Textbook



The textbook for this course is the *Addison-Wesley Applied Mathematics 10 Source Book*, Western Canadian Edition, published by Addison Wesley Longman Ltd. (1999).

Materials, Media, and Equipment

Mandatory Components

Equipment (Hardware)	Media	Materials
• graphing calculator (must be on the list of approved calculators) • computer • vernier caliper • micrometer • measuring tape • geometry set	• companion CD (comes with the course) • spreadsheet program such as Microsoft® *Excel*	• Teacher's Guide for Applied Mathematics 10 • one complete set of Student Module Booklets (7), Project Booklets (7), and Assignment Booklets (7) for each student • the *Addison-Wesley Applied Mathematics 10 Source Book* • There is a Final Test.

> The videocassette and software used in the course may be available from the Learning Resources Distributing Centre or ACCESS. You may also wish to call your regional library service for more information.
>
> Schools must ensure that each student has access to, but not necessarily ownership of, the mandatory equipment (hardware). Graphing calculators, vernier calipers, and micrometers are available from the Learning Resources Distributing Centre.

Optional Components

Equipment (Hardware)	Media	Materials
• videocassette player	• the Internet • optional video and software – Educational Video Resources: *The TI-83 Graphing Calculator Video Tutor* – *Geometer's Sketchpad®* or similar investigative geometry software	• Various materials are necessary in order to complete different activities. Students are urged to complete as many hands-on activities as possible.

Using This Learning Package in the Classroom

Conventional Classroom

Whether your classroom has desks in rows or tables in small groups, you may be most comfortable with a learning system that you can use with all your students in a paced style. In other words, you may want a package that will suit all of your students, so they can move through the materials as one group or several small groups. Because these materials contain different routes or pathways within each module, they can address various learning styles and preferences. The materials also include many choices within the activities to cater to different thinking levels and ability levels. Because of their versatility and flexibility, these materials can easily suit a conventional classroom.

Open Learning Classroom

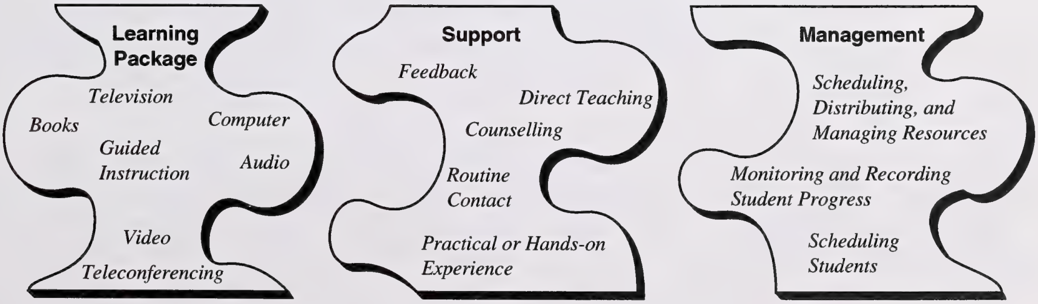
Open learning is the concept of opening up opportunities by overcoming barriers of time, pace, and place by giving the learners a package specially designed to enable them to learn on their own for at least some of the time.

Such a concept is not new. Many teachers can recite attempts to establish an individualized learning system as they recognized the importance of trying to personalize courseware to meet each individual's needs. But these past efforts often failed because of lack of time and lack of quality materials that conformed to Alberta specifications.

Owing to advanced educational technology and improved Alberta-specific learning packages, a student-centred approach is now possible. Improved technology now allows us to provide support to learners individually, regardless of their pace or location. A teacher cannot be in twenty-eight places at one time offering guidance. Media and a well-designed learning package, however, can satisfy individual needs. Technology can also help provide an effective management system needed to track the students as they progress independently through the materials.

The key to a successful open learning system depends on three vital elements: a learning package specially designed to enable students to learn effectively on their own for at least some of the time; various kinds of learner support; and a management system and style that ensures that the open learning system runs smoothly.

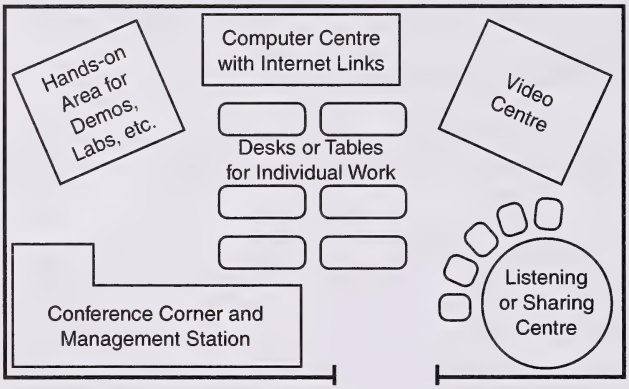
The Key to a Successful Open Learning System



Learning Package

The specially designed learning package needed for a successful open learning system has been developed for you. The objectives teach current Alberta specifications using strategies designed for individualized instruction. As the teacher, you need to be sure to have all of the components in the learning package available to students as needed.

If you are able to acquire media and appropriate hardware to meet your class needs, media centres can be established.


Hands-on Area for Demos, Labs, etc.
Computer Centre with Internet Links
Video Centre
Desks or Tables for Individual Work
Listening or Sharing Centre
Conference Corner and Management Station

You may not have the luxury to have enough hardware to set up a permanent video or computer centre in your classroom. In that case, students should be encouraged to plan ahead. Perhaps every three to five days they should preview their materials and project when they would need a certain piece of media. This would allow you to group students, if necessary, or reserve media as required.

Support

Support is definitely a key element for successful learning, and when you're planning an individualized, non-paced program, you need to carefully plan when and how support will be given.

The materials contain a form of consistent support by providing immediate feedback for activities included in the Student Module Booklet. Students have solutions, models, explanations, and guides included in the Appendix of every booklet. These aids are included so students can receive immediate feedback to clarify and reinforce their basic understanding before they move on to higher levels of thinking.

As the teacher, you may need to offer more support and personal guidance to those students having difficulty. The activities include choices and pathways. If a student is struggling, you may need to encourage that student to work on all of the choices rather than on only one. This would provide additional instruction and practice in a variety of ways.

You may also have to reinforce the need for students to do the sectional activities carefully and thoroughly before attempting the assignments in the Assignment Booklet.

Another form of support is routine contact with each individual. This contact might be achieved with a biweekly conference scheduled by you; or, as students reach a certain point (e.g., after each section is completed), they may be directed to come to the conference area.

Special counselling may be needed to help students through difficult stages. Praise and encouragement are important motivators, particularly for those students who are not used to working independently.

Direct teaching may be needed and scheduled at certain points in the program. This teaching might involve small groups or a large group. It might be used to take advantage of something timely (e.g., election, eclipse), something prescheduled like the demonstration of a process, or something involving students in a hands-on, practical experience.

Support at a distance might include tutoring by phone, teleconferencing, faxing, or planned visits. These contacts are the lifeline between learners and distance education teachers, so a warm dialogue is essential.

Management

Good management of an open learning system is essential to the success of the program. Leadership and promotion of the system are essential. The following areas also need action to ensure that the system runs smoothly:

- Scheduling, Distributing, and Managing Resources—As discussed earlier, in order to do these tasks efficiently you may need to develop media centres or a system for students to reserve the necessary resources.

- Scheduling Students—Students and teachers should work together to establish goals, course completion timelines, and daily timelines. Although students may want to study for long periods of time (e.g., all morning), teachers should discourage this practice. Concentration, retention, and motivation are improved by taking scheduled breaks.

- Monitoring Student Progress—You will need to record the date that each student completes each module and the Final Test. Your data might also include the projected date of completion if you are using a student-contract approach.

Sample of a Student Progress Chart

Applied Mathematics 10		Module 1	Module 2	Module 3	Module 4	Module 5	Module 6	Module 7	Final Test
Billy Adams	P								
	A								
Louise Despins	P								
	A								
Violet Klaissian	P								
	A								

P = Projected Completion Date A = Actual Completion Date

The student could keep a personal log as well. Such tracking of data could be stored easily on a computer.

- Recording Student Assessments—You will need to record the marks awarded to each student for work completed in each module Project Booklet and Assignment Booklet. The marks from these Project Booklets and Assignment Booklets will contribute to a portion of the student's final mark. Other criteria may also be added (a special project, effort, attitude, etc.). Whatever the criteria, they should be made clear to all students at the beginning.

Sample of a Student Assessment Chart

Applied Mathematics 10		Module 1	Module 2	Module 3	Module 4	Module 5	Module 6	Module 7	Year's Average	Other	Final Test	Final Mark
Billy Adams	PB	68	80	72	78	80	65	79	76			
	AB	71	75	76	90	82	65	80				
Louise Despins	PB	75	85	65	80	73	78	75	75			
	AB	70	79	67	80	75	80	75				
Violet Klaissian	PB	80	88	82	95	77	82	92	86			
	AB	80	90	84	90	82	85	96				

PB = Project Booklet AB = Assignment Booklet

Letter grading could easily be substituted.

- Recording Effectiveness of System—Keep ongoing records of how the system is working. This data will help you in future planning.

Sample of a System Assessment Chart

Applied Mathematics 10: Module 1				
Date	Student Module Booklet	Project Booklet	Assignment Booklet	Resources/Media

The Role of the Teacher in an Open Learning Classroom

The teachers in a conventional classroom spend a lot of time talking to large groups of learners. The situation in open learning requires a different emphasis. Teachers will probably meet learners individually or in very small groups.

With this approach, it is necessary to move beyond the idea of a passive learner depending largely on a continually supportive teacher. The teacher must aim to build the student's confidence, to stimulate the learner into self-reliance, and to guide the learner to take advantage of routes that are most meaningful and applicable to the learner.

These materials are student centred, not teacher centred. The teacher needs to facilitate learning by providing general support to the learner.

Evaluation

Evaluation is important to the development of every learner. In order to identify strengths and weaknesses, both students and teachers need to gather and analyse information and make decisions.

These specially designed learning packages contain many kinds of informal and formal evaluation.

Informal Evaluation

Observation

In the classroom, the teacher has the opportunity to see each student perform every day and to become aware of the level and nature of each student's performance.

Observations are more useful if they are recorded in an organized system. The following list of questions is a sample of types of observations and how they can be collected.

Observation Checklist

	B. Adams	L. Despins	V. Klaissian	H. Smith	K. Dalley
1. Does the student approach the work in a positive manner?					
2. Is the student struggling with the reading level?					
3. Does the student make good use of time?					
4. Does the student apply an appropriate study method?					
5. Can the student use references effectively?					

Observation may suggest a need for an individual interview with a student.

Individual Conferences

Individual conferences may be paced (scheduled) by the calendar, designated at certain points in the module, or they may be set up only as needed or requested.

During these conferences, the teacher can determine the student's progress and can assess the student's attitudes towards the subject, program, school, and self, as well as the student's relationship with other students. With guided questions, the teacher can encourage oral self-assessment; the student can discuss personal strengths or weaknesses in regard to the particular section, module, or subject area.

Self-Appraisal

Self-appraisal helps students recognize their own strengths and weaknesses. Through activities that require self-assessment, students also gain immediate feedback and clarification at early stages in the learning process. Teachers need to promote a responsible attitude towards these self-assessment activities. Becoming effective self-assessors is a crucial part of becoming autonomous learners. By instructing, motivating, providing positive reinforcement, and systematically supervising, teachers will help students develop a positive attitude towards their own progress.

For variation, students may be paired and peer-assessing may become part of the system. The teacher may decide to have the student self-assess some of the activities, to have a peer assess other activities, and to become directly involved in assessing the remainder of the activities.

When the modular activities have been assessed, students should be directed to make corrections. This task should be made clear to students right from the beginning. It is important to establish the correct association between the question and the response to clarify understanding, aid retention, and be of use for study purposes.

Many of the activities include choices for students. If students are having difficulty, more practice may be warranted, and students may need to be encouraged to select more of the choices.

Each section within a Student Module Booklet includes additional types of activities called Extra Help and Enrichment. Students are expected to be involved in the decision as to which pathway best suits their needs. They may decide to do both.

Self-appraisal techniques can also be introduced at the individual conferences. Such questions as the following might be included:

- What steps are you taking to improve your understanding of this topic?
- What method of study do you use most?
- How do you organize the material to help you remember it?
- What steps do you follow when you complete an assignment?
- What could you do to become an even better reader?
- Do you have trouble following directions?
- Did you enjoy this module?

A chart or checklist could be used for recording responses.

Assignments

Each module contains two separate booklets: the Project Booklet and the Assignment Booklet. These booklets are an informal evaluation tool for assessing the knowledge or skills that the student has gained from the module. **The student's mark for the module may be based solely on the outcome of learning evident in these booklets; however, you may decide to establish a value for other variables such as attitude or effort.** It is important that you establish at the beginning of the course and each module those outcomes that will be evaluated, and ensure that all students clearly understand what is expected.

Formal Evaluation

This Teacher's Guide includes a formal Final Test that can be photocopied for each member of the class. The test, closely linked to the learning outcomes stated in the Student Module Booklets, gives the teacher precise information concerning what each student can or cannot do. Answers, explanations, and marking guides are also included. The value of the Final Test and each module is the decision of the classroom teacher. Following is a suggestion only.

Module 1	**8%**
Module 2	**5%**
Module 3	**8%**
Module 4	**5%**
Module 5	**8%**
Module 6	**8%**
Module 7	**8%**
Final Test	**50%**

Introducing Students to the System

Your initiation to these learning materials began with a basic survey of what was included and how the components varied. This same process should be repeated with the class. After the materials have been explored, a discussion might include the advantages and the disadvantages of learning independently or in small groups. The roles of the student and teacher should be analysed. The necessary progress checks and rules need to be addressed. Your introduction should motivate students and build a responsible attitude towards learning autonomously.

Skill Level

It is important for students to understand that there are certain skills that they will need in order to deal successfully with the course materials. Those skills are as follows:

- understanding and using instructional materials (table of contents, index, list of illustrations, appendices, bibliography, and glossary)
- interpreting maps, graphs, and charts
- using reference materials
- recognizing special symbols
- using a graphing calculator
- using a computer and spreadsheet and database software
- understanding and using different forms of media

Other general skills follow: using reliable study methods, outlining, and learning to read at a flexible rate.

To decide the level and amount of instruction needed to accommodate the varied levels among students, you may wish to prepare and administer skill inventories or pretests. If most students need help with a particular skill, you may want to plan a total-class instructional session. If only certain students lack a skill, you may want to set up a temporary skill group to help students who need it, or you may want to develop a skills file for this purpose.

Reading Level

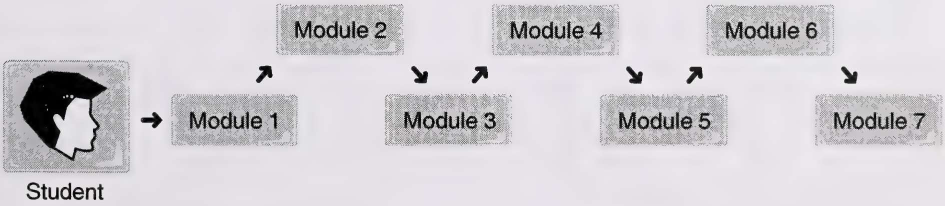
These course materials are largely print based, but poorer readers need not be discouraged. It is important that you assure students that these materials have been designed for easy reading. The authors have employed special strategies to reduce and control the reading level. Some of them are as follows:

- the conscious selection of vocabulary and careful structuring of sentences to keep the materials at an independent reading level
- the integration of activities, examples, and illustrations to break text into appropriate-sized chunks

- the inclusion of many kinds of organizers (advance, graphic, intermediate, concept mapping, post organizers) to help give students a structure for incorporating new concepts
- the recognition that vocabulary and concepts are basic to understanding the content and, thus, must be handled systematically (defined in context, signalled in marginal notes or footnotes, and cited in a glossary)
- the acknowledgement that background knowledge and experience play a vital role in comprehension
- the systematic inclusion of illustrations, videos, audiocassettes, and software to help poorer readers and visual learners
- a use of a variety of formats (paragraphs, lists, charts, etc.) to help struggling readers who do not absorb or retain main ideas easily in paragraph format
- the inclusion of media and activity choices to encourage an active rather than passive approach
- the development of instruction in a meaningful setting rather than in a contrived, workbook style
- the use of purposeful reading, viewing, and doing to produce better interpretation of the course materials
- the recognition that students need structured learning experiences when reading, viewing, or listening to instructional materials; and the acknowledgement that the recognized reading process provides such a structured framework by emphasizing the following phases: developing pupil readiness, determining the purpose, providing guided instruction and feedback, ensuring opportunity to reread or review if necessary, and including enrichment or extensions

To help make the learning package more readable, you can begin your course or module preparation by reading (viewing, listening to) all the related materials that are going to be used. You will need this solid understanding in order to link the content to the students' experiential base. This linking may be done through class brainstorming sessions concerning the topic or by using visuals and guided questions to predict what the course or modules might be about. Such a strategy helps poorer readers strengthen their abilities to be able to predict new vocabulary.

It is recommended that you have students begin with Module 1, because this module includes basic introductory information, and it is also recommended that you end with Module 7, because this module acts as a summary or culmination.



Module 1: Measurement

Overview

This module focuses on a project that involves designing and researching the redecoration of a dream room.

Skills and concepts include the following:

- using direct and indirect measurement to solve problems
- taking and estimating measurements using metric and imperial units
- making measurement conversions within the metric system
- making measurement conversions within the imperial system
- describing the limitations of measuring devices and measurement strategies, using the concepts of precision and accuracy
- determining the volume and surface area of a sphere
- describing the relationship between the scale factor and changes in dimension, area, surface area, or volume

Evaluation

The evaluation of this module will be based on a project and an assignment. These will be weighted as follows:

Module Project	**40 marks**
Module Assignment	**60 marks**
TOTAL	**100 marks**

Module 1: Project Booklet Answer Key (40 marks)

1. The description of the room should be marked on communication, originality, and research. Students should include details of how the room will be decorated, including information on the flooring, wall coverings, baseboards, artwork, lighting, and furniture. **(5 marks)**

2. Marks should be awarded for neatness, attention to scale, and accuracy. All the measurements needed to calculate the amount of baseboards, flooring, and paint and/or wallpaper, and so on should be included. The floor plan should include the placement of a bed, dresser, desk, and chair. See the sample floor plan on page 59 of the textbook and the suggested answers to the exercise in the Student Module Booklet. **(10 marks)**

3. The students should correctly calculate the amount of baseboard. Amounts should exclude doorways and areas covered by built-in cupboards (as in the bathroom, perhaps). **(4 marks)**

4. **a.** The students may choose to carpet part of the floor and use linoleum, hardwood, tile, or other materials on another portion of the floor. **(1 mark)**

   b. The students should correctly calculate the amount of each type of flooring. **(4 marks)**

5. **a.** The students should indicate whether the walls and ceilings are painted or wallpapered or have other wall treatments and whether one or two coats of paint will be used. **(1 mark)**

   b. The students should correctly calculate the amount of paint and/or wallpaper or other materials required. **(5 marks)**

6. The students should correctly give a breakdown of costs and correctly calculate the costs. The costs should be reasonable. They should total $5000 or less. The students may include actual or photocopied ads for products. **(10 marks)**

Module 1: Assignment Booklet Answer Key (60 marks)

1. **a.** 13.4 cm **(2 marks)** **b.** $5\frac{3}{16}$ inches **(2 marks)**

2. **a.** The uncertainty of the measurement is ± 0.05 cm. **(2 marks)**

b. The uncertainty of the measurement is $\pm\frac{1}{32}$ of an inch. **(2 marks)**

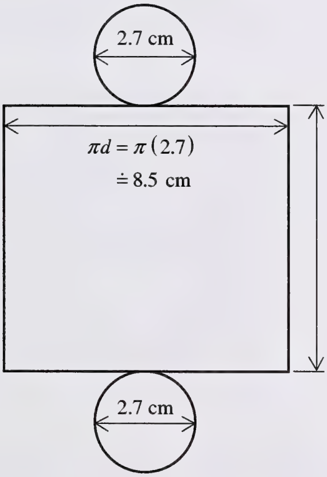
3. **a.** $2\frac{115}{128}$ inches **(2 marks)** **b.** $3\frac{31}{32}$ inches **(2 marks)**

7.38 cm **(2 marks)** 10.11 cm **(2 marks)**

4. **a.** 8.21 mm **(2 marks)** **b.** 12.25 mm **(2 marks)**

5. Students should use the π key on the calculator instead of a rounded value of π.

a. Marks should be awarded for communication.



The net should be made up of a rectangle that is 8.5 cm by 8.1 cm, and two circles, each with a diameter of 2.7 cm. Students may include an allowance of approximately 0.2 cm for each dimension.

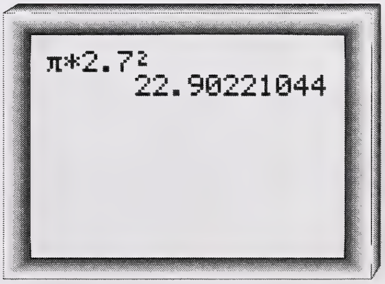
In order for 3 tennis balls to fit in the cylinder, the height of the cylinder should be $3 \times 2.7 = 8.1$ cm.

(5 marks)

b. $A = \pi d^2$

$= \pi(2.7)^2$

$\doteq 23$

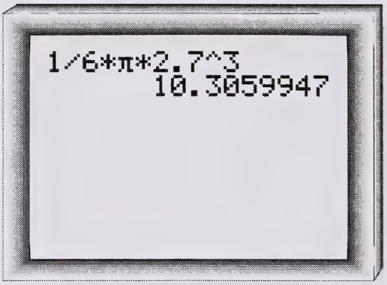


```
π*2.7²
        22.90221044
```

The surface area of one tennis ball is about 23 cm^2. **(3 marks)**

Note: Be sure the students include the correct units and round the answer to a reasonable place value.

c.
$$\begin{aligned} V &= \frac{1}{6}\pi d^3 \\ &= \frac{1}{6}\pi(2.7)^3 \\ &\doteq 10 \end{aligned}$$

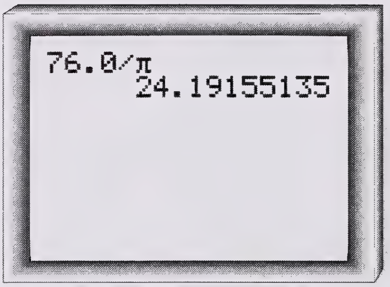


```
1/6*π*2.7^3
            10.3059947
```

The volume of one tennis ball is about 10 cm^3. **(3 marks)**

Note: Be sure the students include the correct units and round the answer to a reasonable place value.

6.
$$\begin{aligned} C &= \pi d \\ 76.0 &= \pi d \\ d &= \frac{76.0}{\pi} \\ &\doteq 24.2 \end{aligned}$$

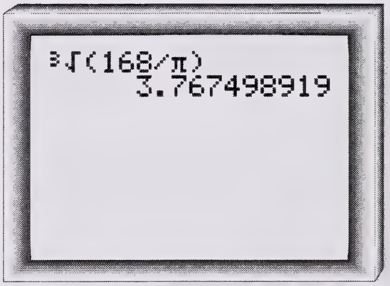


```
76.0/π
           24.19155135
```

The diameter is approximately 24.2 cm. **(3 marks)**

Note: The students should use the π key on the calculator. Be sure the students include the correct units and round to a reasonable place value.

7.
$$\begin{aligned} V &= \frac{1}{6}\pi d^3 \\ 28 &= \frac{1}{6}\pi d^3 \\ 168 &= \pi d^3 \\ \frac{168}{\pi} &= d^3 \\ d &= \sqrt[3]{\frac{168}{\pi}} \\ d &\doteq 3.8 \end{aligned}$$



```
³√(168/π)
           3.767498919
```

The diameter of the ball is about 3.8 inches. **(3 marks)**

Note: The students should use the π key on the calculator. Be sure the students include the correct units and round to a reasonable place value.

8. **a.**
$$\begin{aligned} &1\ \text{mL} = 1\ \text{cm}^3 \\ \therefore\ &82\ \text{mL} = 82\ \text{cm}^3 \end{aligned}$$

The ball bearing has a volume of about 82 cm^3. **(2 marks)**

b. The uncertainty is $\pm 0.5\ \text{cm}^3$. **(2 marks)**

9. Students will probably not have to calculate the surface area or volume.

a. $\frac{\text{Sphere A}}{\text{Sphere B}}$ $\frac{6}{12} = \frac{1}{2}$ The ratio of the diameter of Sphere A to the diameter of Sphere B is 1:2. **(2 marks)**

b. $2^2 = 4$ The ratio of the surface area of Sphere A to the surface area of Sphere B is 1:4. **(2 marks)**

c. $2^3 = 8$ The ratio of the volume of Sphere A to the volume of Sphere B is 1:8. **(2 marks)**

d. These ratios are not the same because of the relationship between scale factor, surface area, and volume. Doubling the scale factor increases the surface area by a factor of 4 and increases the volume by a factor of 8. **(3 marks)**

10. The students may use one of the following methods:

Method 1	**Method 2**
1 square yard = 9 square feet	1 square foot = $\frac{1}{9}$ square yard
$\$5.95 \times 9 = \$53.55$ per square yard	$\$38.95 \times \frac{1}{9} = \$4.33$ per square foot
∴ The carpet at Store A costs $53.55 per square yard.	∴ The carpet at Store B costs $4.33 per square foot.
The problem states that the carpet at Store B costs $38.95 per square yard.	The problem states that the carpet at Store A costs $5.95 per square foot.
Because $\$38.95 < \$53.55$, the carpet at Store B costs less.	Because $\$4.33 < \$5.95$, the carpet at Store B costs less.

(5 marks)

11. Textbook exercise 9 of "Exercises: Checking Your Skills," p. 53

Students need to answer only one part of exercise 9 on page 53 of the textbook. Answers will vary, but students should conclude that there are significant health implications if a child were enlarged by a factor of 32.

Some comments could include the following:

- **Transpiration system:** The area of skin would increase by a scale factor of 32^2 or 1024. The heat generated by the body would increase by a scale factor of 32^3 or 32 768. Therefore, your body would overheat.
- **Respiratory system:** The number of cells would increase by a scale factor of 32^3 or 32 768. The surface area of your lungs would only increase by a scale factor of 32^2 or 1024. Therefore, you would be gasping for air.
- **Skeletal system:** Your mass would increase by a scale factor of 32^3 or 32 768. The strength of your bones would increase by only a scale factor of 32^2 or 1024. Therefore, your bones would not be able to support your mass.

(5 marks)

Module 2: Number Patterns in Tables

Overview

This module focuses on a project that involves planning a small business, creating an inventory for the business, and establishing a table of daily costs and daily sales for the business.

Skills and concepts include the following:

- Use words and algebraic expressions to describe data in a table with rows that are independent of each other.
- Know the basic parts of a spreadsheet and how to modify a spreadsheet to produce a given result.
- Create, modify, and use a table of data with rows that are independent of each other.
- Use words and algebraic expressions to describe data in a table with rows that are related recursively.
- Create, modify, and use a table of data with rows that are related recursively.
- Read and use tables that are created by a spreadsheet.
- Create and modify tables using a spreadsheet.
- Predict what will happen when a spreadsheet is modified.

Evaluation

The evaluation of this module will be based on a project and an assignment. These will be weighted as follows:

Module Project	**40 marks**
Module Assignment	**60 marks**
TOTAL	**100 marks**

Module 2: Project Booklet Answer Key (40 marks)

Answers for the project will vary. Suggestions for marking guidelines are given.

1. Students should have a description of the store they picked to set up with details as suggested in the Project Booklet. Stores may be modelled after the example in the textbook, but award marks for originality. **(8 marks)**

2. Answers will vary.

Students should complete an inventory table on a spreadsheet. Students should include both the normal view and the formula view. The inventory table should have these headings.

Item	Cost Price/Item ($)	Quantity	Cost to Purchase Stock ($)	Calculate Markup/ Item ($)	Retail Price ($)	Gross Profit/Item ($)	Total Gross Profit ($)

The completed inventory table should have at least 20 items listed that would be sold in the store. Appropriate quantities and costs of each item should be given. Calculated values should be accurate. **(8 marks)**

3. Answers will vary. Estimates of quantities would be based on sales expectations. **(2 marks)**

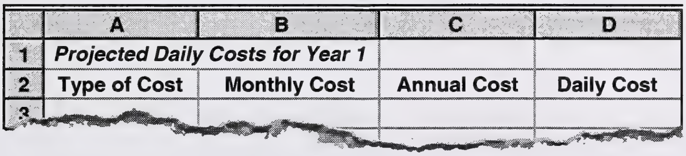
4. Answers will vary. Students should have made estimates by locating items in flyers, catalogues, or newspapers and deducting a percentage (for example, 40%) from the price listed. They may also have talked to retailers to determine markup and wholesale prices. **(2 marks)**

5. Answers will vary. Markup may be a single rate or may be based on the cost of the item. For example, a high-cost item may have a low percent markup while a low-cost item may have a high percent markup. **(2 marks)**

6. Answers will vary. Students will have determined the retail price by adding the markup to the cost price. They may have adjusted the final price to be just under the next lower or higher dollar amount. Calculations should be accurate. **(2 marks)**

7. Answers will vary. Textbook exercises 1 to 9 on pages 102 to 103 involve having students create a spreadsheet that will reflect the daily costs and sales of the students' store. Values in the spreadsheet should follow the guidelines given in the exercises.

   Answers should include a spreadsheet with the following headings.



	A	B	C	D
1	*Projected Daily Costs for Year 1*			
2	**Type of Cost**	**Monthly Cost**	**Annual Cost**	**Daily Cost**
3				

   The spreadsheet should also include headings for gross profit and net profit. Consult the textbook for guidance in awarding marks. Does the spreadsheet provide answers to all exercises? Do the given values follow the guidelines given in the textbook? **(8 marks)**

8. **a.** Answers will vary. Interest charges would be calculated by multiplying the amount of the loan by the rate of interest per annum using the simple interest formula $I = prt$. For example, for a loan of \$60 000 at a rate of 9% per annum,

$$\begin{aligned} I &= prt \\ &= \$60\ 000 \times 0.09 \times 1 \\ &= \$5400 \end{aligned}$$

   Calculations should be accurate. **(2 marks)**

   b. Answers will vary. The daily interest charges would be determined by dividing the annum (yearly) interest amount by 365 (the number of days in a year). An example follows.

$$\begin{aligned} \text{Daily Interest} &= \frac{\text{yearly interest}}{365} \\ &= \frac{5400}{365} \\ &= 14.79 \end{aligned}$$

   The daily interest is \$14.79.

   Calculations should be accurate. **(2 marks)**

9. Answers will vary. Calculations will depend on total annual expenses. The number more of each item would be determined by dividing the amount of the annual cost above the gross profit by the amount of profit. Students may have made up the difference from the additional sales of one item, of several items, or additional sales of all items. **(2 marks)**

10. Answers will vary. Answers will be the amount left over after all expenses have been paid. This amount could be a loss (negative amount). Calculations should be accurate. **(2 marks)**

Module 2: Assignment Booklet Answer Key (60 marks)

1. **a.** The value in cell D2 is obtained by multiplying the value in cell B2 (the cost of the item on January 1) by the value in cell C2 (the inflation rate). The formula in cell D2 is = **B2 * C2** . **(2 marks)**

b. Cell $D3 = B3 \times C3$

$$= 1267.32 \times 4.36 \div 100$$

$$= 1267.32 \times 0.0436$$

$$\doteq 55.26$$

The price increase in 1992 is $55.26. **(2 marks)**

c. You need to know the cost of the item on December 31, 1992. **(1 mark)**

d. Because the cost of the item on January 1, 1993, is dependent on the cost of the item on December 31, 1992, this type of table is called a recursive table. **(1 mark)**

e.

	A	B	C	D	E
1	Year	Cost of Item Jan. 1	Inflation Rate	Price Increase	Cost of Item Dec. 31
2	1991	$1,200.00	5.61%	$67.32	$1,267.32
3	1992	$1,267.32	4.36%	$55.26	$1,322.58
4	1993	$1,322.58	3.88%	$51.32	$1,373.89

(2 marks)

2. **Nelda's Players**

Player	Goals	Assists	Plus/Minus	Points
K. Tkachuk	40	26	9	110.5
C. Chelios	3	39	−7	41.5
S. Cote	4	21	−3	27.5
D. Mironov	8	35	−7	47.5
M. Recchi	32	42	11	111.5
			Total Points	338.5

(5 marks)

Nickolas's Players

Player	Goals	Assists	Plus/Minus	Points
M. Sundin	42	61	14	152.0
J. Roenick	24	32	9	84.5
T. Fleury	27	51	0	105.0
J. Beranek	33	39	6	108.0
P. Bure	51	39	5	143.5
			Total Points	593.0

(5 marks)

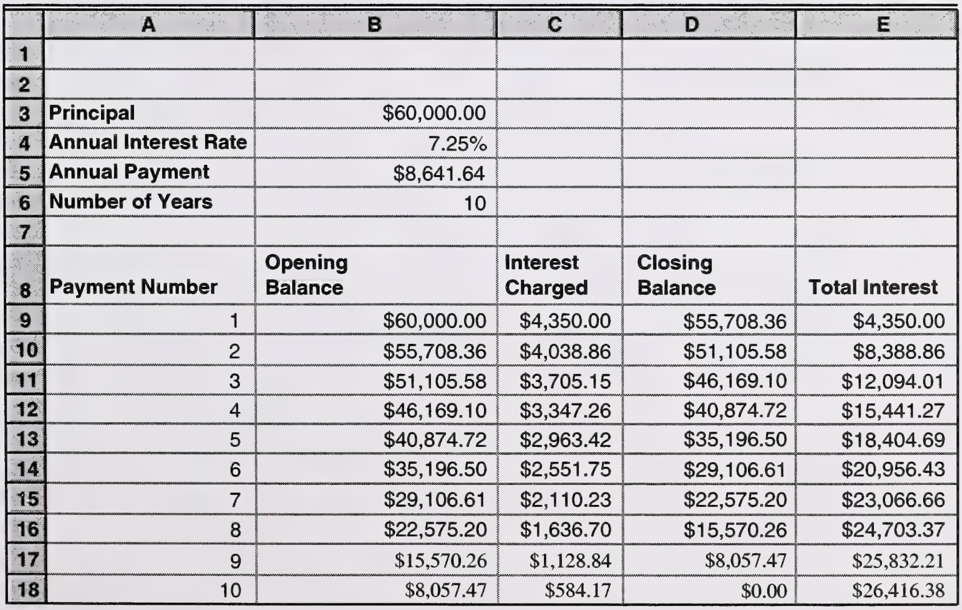
3. A ready reckoner is a table that can be used with mental math to quickly determine the cost of an item, including taxes. **(2 marks)**

4. **a.** The term of the loan is 10 years. **(1 mark)**

   b. The formula used to calculate cell C9 is = **B9 * B4** . **(2 marks)**

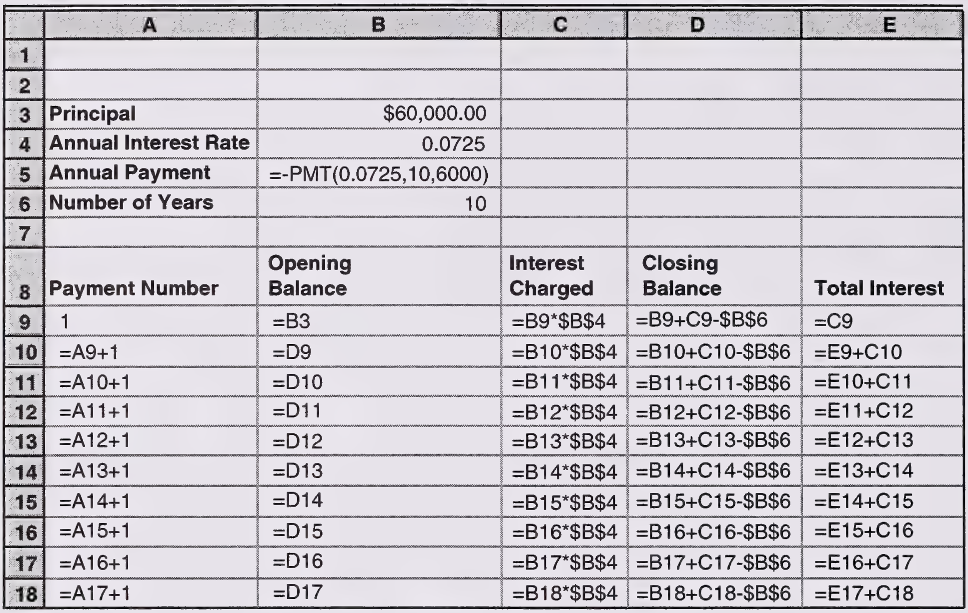
   c. The formula for the closing balance in cell D9 takes the opening balance (cell B9), adds the interest charged (cell C9), and then subtracts the regular payment (cell B5) from the sum. The reason why the last part of the formula uses $ symbols is because the $ symbol tells the spreadsheet to use the value in B5 for the calculation in each row. **(3 marks)**

   d. **Regular View**



	A	B	C	D	E
1					
2					
3	**Principal**	$60,000.00			
4	**Annual Interest Rate**	7.25%			
5	**Annual Payment**	$8,641.64			
6	**Number of Years**	10			
7					
8	**Payment Number**	**Opening Balance**	**Interest Charged**	**Closing Balance**	**Total Interest**
9	1	$60,000.00	$4,350.00	$55,708.36	$4,350.00
10	2	$55,708.36	$4,038.86	$51,105.58	$8,388.86
11	3	$51,105.58	$3,705.15	$46,169.10	$12,094.01
12	4	$46,169.10	$3,347.26	$40,874.72	$15,441.27
13	5	$40,874.72	$2,963.42	$35,196.50	$18,404.69
14	6	$35,196.50	$2,551.75	$29,106.61	$20,956.43
15	7	$29,106.61	$2,110.23	$22,575.20	$23,066.66
16	8	$22,575.20	$1,636.70	$15,570.26	$24,703.37
17	9	$15,570.26	$1,128.84	$8,057.47	$25,832.21
18	10	$8,057.47	$584.17	$0.00	$26,416.38

Formula View



	A	B	C	D	E
1					
2					
3	**Principal**	$60,000.00			
4	**Annual Interest Rate**	0.0725			
5	**Annual Payment**	=-PMT(0.0725,10,6000)			
6	**Number of Years**	10			
7					
8	**Payment Number**	**Opening Balance**	**Interest Charged**	**Closing Balance**	**Total Interest**
9	1	=B3	=B9*$B$4	=B9+C9-$B$6	=C9
10	=A9+1	=D9	=B10*$B$4	=B10+C10-$B$6	=E9+C10
11	=A10+1	=D10	=B11*$B$4	=B11+C11-$B$6	=E10+C11
12	=A11+1	=D11	=B12*$B$4	=B12+C12-$B$6	=E11+C12
13	=A12+1	=D12	=B13*$B$4	=B13+C13-$B$6	=E12+C13
14	=A13+1	=D13	=B14*$B$4	=B14+C14-$B$6	=E13+C14
15	=A14+1	=D14	=B15*$B$4	=B15+C15-$B$6	=E14+C15
16	=A15+1	=D15	=B16*$B$4	=B16+C16-$B$6	=E15+C16
17	=A16+1	=D16	=B17*$B$4	=B17+C17-$B$6	=E16+C17
18	=A17+1	=D17	=B18*$B$4	=B18+C18-$B$6	=E17+C18

(4 marks)

Note: If students create a new spreadsheet, they should include a formula view.

5. **a.** The table may look like the following. If students submit a spreadsheet table, they should include a formula view.

Store	Original Price	Day 1 Price	Day 2 Price	Day 3 Price	Day 4 Price
A	$195.00	$175.50	$156.00	$136.50	$117.00
B	$195.00	$175.50	$157.95	$142.16	$127.94

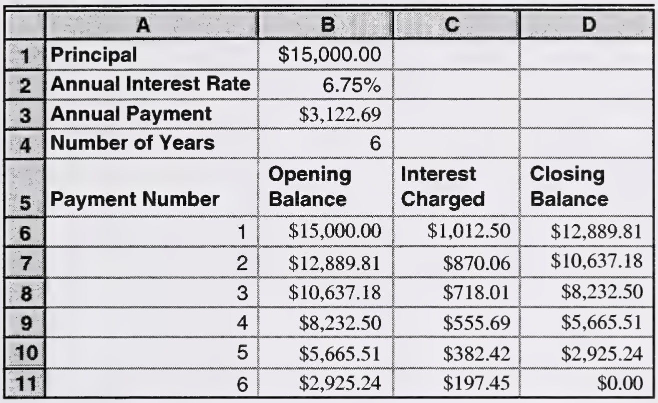
(6 marks)

b. The sale in Store A is better for the customer. **(1 mark)**

c. The sale in Store B is better for the store. **(1 mark)**

d. The reduction in the sale for Store A is greater after Day 1 because the reduction is always 10% of the original price of $195, rather than 10% of the reduced prices. **(2 marks)**

6. **a.** The completed table will look as follows. The couple must make an annual payment of **$3122.69**.



	A	B	C	D
1	Principal	$15,000.00		
2	Annual Interest Rate	6.75%		
3	Annual Payment	$3,122.69		
4	Number of Years	6		
5	Payment Number	Opening Balance	Interest Charged	Closing Balance
6	1	$15,000.00	$1,012.50	$12,889.81
7	2	$12,889.81	$870.06	$10,637.18
8	3	$10,637.18	$718.01	$8,232.50
9	4	$8,232.50	$555.69	$5,665.51
10	5	$5,665.51	$382.42	$2,925.24
11	6	$2,925.24	$197.45	$0.00

(5 marks)

b. The formula would need to be changed in cell D8. The new formula would be = **B8 + C8**. **(2 marks)**

c. The amount that would have to be paid out in a lump sum at the end of 6 years is $3798.68. **(3 marks)**

7. Cost of Living in India (in Canadian dollars)

Income	Housing	Food	Transportation	Utilities	Taxes
$370.87	$118.00	$75.86	$16.86	$30.34	$67.43
$1146.33	$269.72	$144.98	$67.43	$59.00	$303.44

(6 marks)

8. **a.** **term of a loan:** the length of time over which a loan is paid **(1 mark)**

b. **recursive table:** a table in which the values in one row are dependent on the values in the previous row **(1 mark)**

c. **current cell:** the active or selected cell **(1 mark)**

d. **markup:** the difference between the cost of an item and its selling price **(1 mark)**

Module 3: Relations and Functions

Overview

This module focuses on a project that involves researching and reporting on epidemics.

Skills and concepts include the following:

- representing data using function models
- depicting functions with equations, graphs, and other forms
- applying a graphing tool to make graphs
- using function notation to evaluate functions
- finding the domain and range of a function
- using function models to investigate phenomena in the real world

Evaluation

The evaluation of this module will be based on a project and an assignment. These will be weighted as follows:

Module Project	**40 marks**
Module Assignment	**60 marks**
TOTAL	**100 marks**

Module 3: Project Booklet Answer Key (40 marks)

1. Answers will vary. Answers should be marked based on completeness and accuracy.

   Some reasons for an epidemic coming to an end include the following:

   - In most epidemics, most of the infected people recover naturally or through treatment. These people may then no longer be contagious.

   - In most epidemics, some people develop natural immunity. In other words, not all people will become ill.

   - Infected people may be quarantined, thereby stopping the spread of the disease.

   - The society usually receives education that causes people to avoid situations that will spread the disease.

   (10 marks)

2. Answers in the two charts will vary. Answers should be marked on completeness and accuracy. **(10 marks)**

3. The mathematical descriptions of the two epidemics should include the number of victims and trend in each epidemic's growth and decline. Students should include tables and graphs. Students may choose to use word-processing and spreadsheet programs, or they may choose to make the tables and graphs by hand. **(20 marks)**

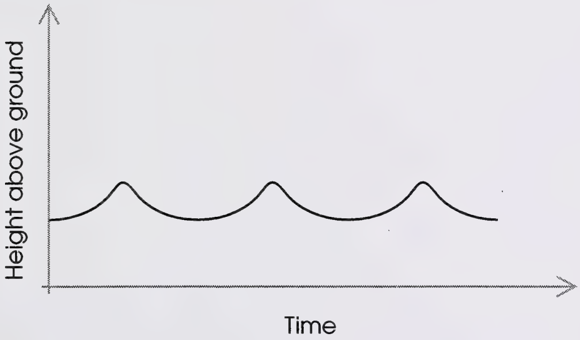
Module 3: Assignment Booklet Answer Key (60 marks)

1. Answers will vary. Following is a sample response.

Rhonda walks a few blocks to the bus stop. She waits for a few minutes at the bus stop. She then catches the bus for the next portion of the trip. Finally, Rhonda walks the rest of the way to school. **(2 marks)**

2. Graph **C** is the best choice. **(2 marks)**

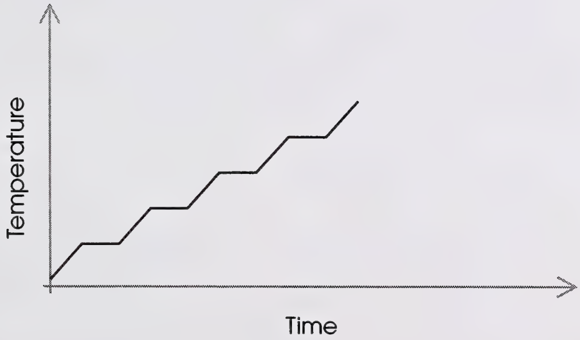
3. a. The sketch of the graph should look similar to the following.



(2 marks)

b. The peaks on the sketch are the ends of each swing cycle, just before the swinger changes direction, and either swings backwards and lower, or forward and lower. The lowest point in each cycle of the sketch is when the swinger is the closest to the ground. The peaks may vary in height depending on how hard the swinger "pumps" the swing. **(2 marks)**

4. a. The graph should look similar to the following.

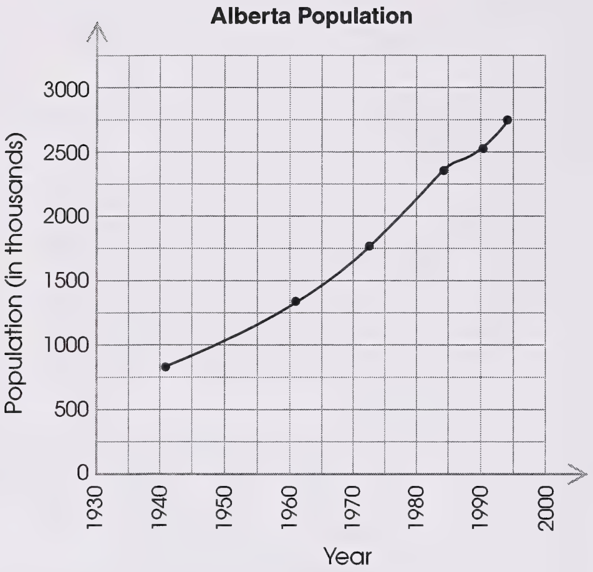


(2 marks)

b. Horizontal line segments correspond to the off-status of the magnetron.

Sloped line segments correspond to heating during the on-status of magnetron. **(2 marks)**

5. **a.**



(2 marks)

b. Window **B** is the best choice. **(2 marks)**

6. **a.** The independent variable would be altitude; the dependent variable would be temperature.

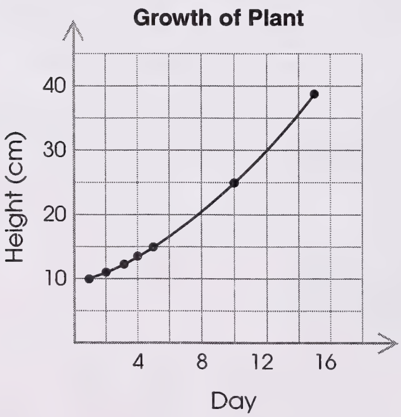
For every value of the altitude, there is only one temperature. However, there is more than one value of altitude for many values of temperature. Therefore, temperature cannot be the independent variable. **(2 marks)**

b. The temperature is coldest at an altitude of 10 km to 20 km. **(2 marks)**

7. **a.** $(1,10)$, $(2,12)$, $(3,13)$, $(4,14)$, $(5,15)$, $(10,25)$, $(15,39)$ **(2 marks)**

b. No, the graph will not continue forever; the height will reach a maximum or the plant will die. **(2 marks)**

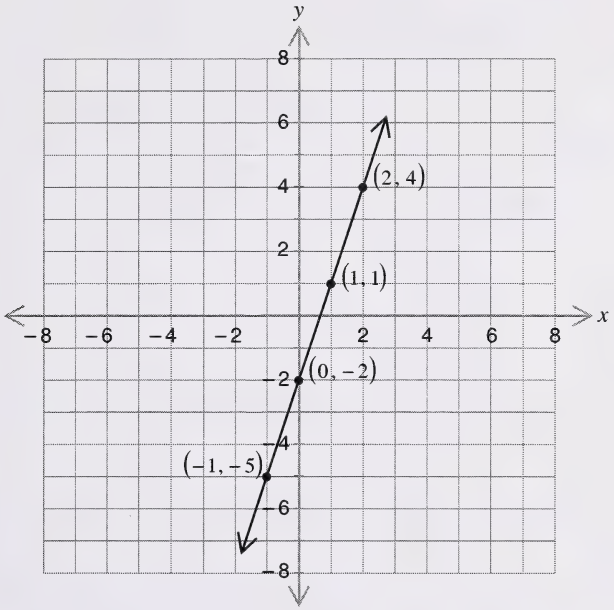
c.



(2 marks)

8. **a.** Values chosen for a table of values may vary. Students may indicate any two points by their coordinate pairs.

x	y
-1	-5
0	-2
1	1
2	4



(4 marks)

b. You must check that all stat plots are turned off. You can use the default WINDOW settings.

Press Y= . If there is an equation on the first line, press CLEAR . To enter the equation, press 3 X,T,Θ,*n* − 2 ENTER . Then press GRAPH . **(2 marks)**

9. Chart **D** represents a relation that is not a function. **(2 marks)**

10. **a.** Students may use either the TRACE feature or TABLE feature of their graphing calculators to answer these questions. Students may elect to use algebra.

If $w = 0$, then
$t = 20$

The temperature was 20°C inside the tent when it was $0°\text{C}$ outside. **(2 marks)**

If $w = -5$, then
$t = 12.5$

The temperature was 12.5°C inside the tent when it was $-5°\text{C}$ outside. **(2 marks)**

If $w = -10$, then
$t = 5$

The temperature was 5°C inside the tent when it was $-10°\text{C}$ outside. **(2 marks)**

b. $t(w) = 1.5w + 20$ **(2 marks)**

11. **a.**

Stage	Number of Phone Calls
1	3
2	9
3	27
4	81
5	243

(2 marks)

b. $y = x^3$ **(2 marks)**

12. **a.** The cost of the phone calls is $0.50 per minute or fractional part of a minute. **(2 marks)**

b. The domain of the relation is all the values in minutes greater than or equal to 0 and less than or equal to 75. **(2 marks)**

c. Yes, it is a function. Every x-value has one and only one y-value. **(2 marks)**

13. **a.** The domain is given by **C**. **(2 marks)**

b. No, there are two y-values for many of the x-values. **(2 marks)**

14. **a.** Yes, there is one and only one y-value for every x-value. **(2 marks)**

b. $y = 3x + 1$ **(2 marks)**

Module 4: Sampling

Overview

In Module 4 students will collect and analyse data to make predictions about a population.

Skills and concepts include the following:

- bias
- census
- sampling
- inference
- population
- survey

Students will implement and analyse sampling precedures that will result in an appropriate, unbiased sample from a given population. They will draw appropriate inferences from the data collected, make generalizations about populations, and justify their conclusions.

Evaluation

The evaluation of this module will be based on a project and an assignment. These will be weighted as follows:

Module Project	**40 marks**
Module Assignment	**60 marks**
TOTAL	**100 marks**

Module 4: Project Booklet Answer Key (40 marks)

Answers will vary. Marking guidelines follow.

1. Students should briefly describe their planned business. They should clearly indicate what the product(s) and/or service(s) the business is offering, the price range that may be charged, and who the potential customers are. **Note:** Students may have chosen the business they selected in Module 2 or they may have chosen a new venture. Award marks for completeness and appropriateness. **(5 marks)**

2. The sampling method should be one in which a random sampling method is used. Students may have used one of the four methods described on pages 181 and 182 of the textbook. The population sampled could be the community where the business is located. Other populations, such as a large-area population for a mail-order business or an Internet population, may be proposed. Students may have difficulty determining a sample from such populations. **(5 marks)**

3. Students should include a copy of a questionnaire with questions specific to their planned business. The questions should pertain to interest in the product(s) and/or service(s) offered, hours of operation, pricing structure, as well as any additional pertinent questions. **(5 marks)**

4. Students should indicate where, when, and how the survey was conducted. They should also indicate the size of the sample and the groups of people interviewed. Students should state whether the survey was conducted by interviewing in person, by telephone, or through the Internet. Students should mention things like lack of response or reluctance to answer interview questions through telephone or direct survey. **(5 marks)**

5. Students should include the percentage of favourable and unfavourable responses to each question. Calculations should be correct. **(10 marks)**

6. Students should summarize the results to the questions and indicate overall favourable or unfavourable responses. A discussion of the most suitable hours of operation and most acceptable pricing structure should be included. Students should conclude with a discussion as to whether the business would be feasible. Are the conclusions reached appropriate and valid? **(10 marks)**

Module 4: Assignment Booklet Answer Key (60 marks)

1. A sample is often used when conducting a survey because it may too expensive or impossible to use the entire population in the survey. A sample may be the only way a survey can be done if the population is very large and if it covers a large area. **(3 marks)**

2. The entire population is surveyed when you want an accurate count of each member of the population. Such a survey is called a census. **(3 marks)**

3. The population that you would sample for each situation is as follows:

   a. residents of the city of Edmonton and surrounding area **(2 marks)**
   b. residents of legal age in Alberta **(2 marks)**
   c. students and staff of the school involved **(2 marks)**

4. A cluster sample is one in which a subgroup is randomly selected from a population, and all members in the subgroup are part of the sample. For example, one class in each grade in a large high school may be selected at random. **(4 marks)**

5. A stratified random sample is used when you want a proportionate number of members from each of a number of groups of varying size. An example could be where a car dealership randomly selects a number of each model of vehicles. **(4 marks)**

6. A systematic sample is usually used to check assembly-line items because of the identical nature of the items. A random selection at regular intervals will identify a number of defective items. This percentage can then be projected over the population. **(3 marks)**

7. Convenience sampling is used to select the sample in this case. The people selected tend to have similar likes to those of the interviewer. The people are also similar in age. The average person in the town or city may not have similar likes. **(4 marks)**

8. This is self-selected sampling. Most respondents would feel very strongly for or against the suggestion. This survey method is not very reliable or valid because a much different group of students may respond on a different occasion. **(5 marks)**

9. Convenience sampling is called a non-probability sampling because the sample is not chosen randomly. In a convenience sample, the individuals chosen have a common element that has led to their selection. **(3 marks)**

10. Answers will vary but should involve a description of using **one** of the following four techniques for generating random numbers. Pages 180 and 181 in the textbook offer an explanation of each technique.

    - a spinner
    - a telephone directory
    - a graphing calculator
    - a computer spreadsheet

    (5 marks)

11. Answers may vary. A sample answer is given.

    a. A non-probability technique you could use is to have listeners phone in and offer their opinions on the upcoming election. **(1 mark)**

    b. Sampling using a phone-in technique is a self-selected sample. **(1 mark)**

12. Answers may vary. A sample answer is given.

    The following steps can be used to randomly select 8 students.

    Step 1: Assign each student a number between 1 and 24 inclusive.
    Step 2: Use your graphing calculator to generate a random number between 1 and 24.
    Step 3: Record the name of the student whose name corresponds to the number.
    Step 4: Repeat step 2 and step 3 seven more times.

    (3 marks)

13. Answers will vary. A sample answer is given.

a. The population would be all taxpayers in the school district. **(2 marks)**
b. The question could be like the following:

> Are you in favour of year-round schooling for all students in our school district?
>
> Circle your response. YES NO

(3 marks)

c. The steps for conducting the survey should include the following:

Step 1: Prepare the questions(s).

Step 2: Decide on the population involved. Use a random sampling technique to select an adequate sample (the technique should be described).

Step 3: Decide how the survey will be conducted (questionnaire, telephone survey, interview).

Step 4: Carry out the survey and collect the responses.

Step 5: Analyse the results and draw conclusions.
(5 marks)

14. Closed-end questions are generally used because they are more specific and help keep responses on track with the intent of the question. Also, the responses are much easier to process and analyse. **(3 marks)**

15. Answers will vary. Reasons why a company might want to use a telephone survey are as follows:

- Telephone surveys are relatively inexpensive.
- Telephone surveys are similar to an interview: there is interaction between the caller and the respondent.
- It is easy to get a random sample.
- It is easy to survey people over a large area.

Students may list other valid reasons. **(2 marks)**

Module 5: Line Segments

Overview

This module focuses on a project that involves designing a water ride.

Skills and concepts include the following:

- using the distance formula for line segments on a coordinate grid to solve problems
- using the formula for the coordinates of the midpoint of a line segment on a coordinate grid to solve problems
- using the slope formula for line segments on a coordinate grid to solve problems
- using the relationship between the slopes of parallel and perpendicular line segments on a coordinate grid to solve problems

Evaluation

The evaluation of this module will be based on a project and an assignment. These will be weighted as follows:

Module Project	**50 marks**
Module Assignment	**50 marks**
TOTAL	**100 marks**

Module 5: Project Booklet Answer Key (50 marks)

1.–3. Answers will vary. Marks should be awarded for completeness and accuracy. As a guide, you may wish to use the examples on pages 251 and 252 of the textbook and the responses to the project questions in the Appendix of the Student Module Booklet.

Module 5: Assignment Booklet Answer Key (50 marks)

1. a.

$$\begin{aligned} PQ &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{[5-(-4)]^2 + [(-1)-(-7)]^2} \\ &= \sqrt{9^2 + 6^2} \\ &= \sqrt{81 + 36} \\ &= \sqrt{117} \\ &\doteq 10.8 \end{aligned}$$

The segment is about 10.8 units long. **(3 marks)**

b.

$$\begin{aligned} x_M &= \frac{x_1 + x_2}{2} \\ &= \frac{-4+5}{2} \\ &= \frac{1}{2} \quad \text{or} \quad 0.5 \end{aligned}$$

$$\begin{aligned} y_M &= \frac{y_1 + y_2}{2} \\ &= \frac{-7+(-1)}{2} \\ &= \frac{-8}{2} \\ &= -4 \end{aligned}$$

The midpoint of PQ is $(0.5, -4)$. **(3 marks)**

c.

$$\begin{aligned} \text{Slope of } PQ &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{-1-(-7)}{5-(-4)} \\ &= \frac{6}{9} \\ &= \frac{2}{3} \end{aligned}$$

Methods may vary. Students may use other acceptable methods of finding the slope.

The slope of PQ is $\frac{2}{3}$. **(3 marks)**

2. **a.** Methods may vary. Following is one acceptable method.

$$\begin{aligned} MN &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{[5-(-6)]^2 + (3-3)^2} \\ &= \sqrt{(5+6)^2 + 0^2} \\ &= \sqrt{11^2 + 0^2} \\ &= \sqrt{121} \\ &= 11 \end{aligned}$$

Line segment *MN* is 11 units long. **(3 marks)**

b.

$$\begin{aligned} x_M &= \frac{x_1 + x_2}{2} \\ &= \frac{-6+5}{2} \\ &= \frac{-1}{2} \\ &= -0.5 \quad \text{or} \quad -\frac{1}{2} \end{aligned}$$

$$\begin{aligned} y_M &= \frac{y_1 + y_2}{2} \\ &= \frac{3+3}{2} \\ &= \frac{6}{2} \\ &= 3 \end{aligned}$$

The midpoint is $(-0.5, 3)$. **(3 marks)**

c.

$$\begin{aligned} \text{Slope of } MN &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{3-3}{5-(-6)} \\ &= \frac{0}{11} \\ &= 0 \end{aligned}$$

Methods may vary. This is one acceptable method.

The slope of *MN* is 0. **(3 marks)**

3. **a.** Methods may vary. Following is one acceptable method.

$$\begin{aligned} AB &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(2-2)^2 + [(-3)-6]^2} \\ &= \sqrt{0^2 + (-9)^2} \\ &= \sqrt{81} \\ &= 9 \end{aligned}$$

Line segment *AB* is 9 units long. **(3 marks)**

b.

$$\begin{aligned} x_M &= \frac{x_1 + x_2}{2} \\ &= \frac{2+2}{2} \\ &= \frac{4}{2} \\ &= 2 \end{aligned}$$

$$\begin{aligned} y_M &= \frac{y_1 + y_2}{2} \\ &= \frac{6+(-3)}{2} \\ &= \frac{3}{2} \\ &= 1\frac{1}{2} \quad \text{or} \quad 1.5 \end{aligned}$$

The midpoint of *AB* is $(2, 1.5)$. **(3 marks)**

c. Methods may vary. Following is one acceptable method.

$$\begin{aligned} \text{Slope of } AB &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{-3-6}{2-2} \\ &= \frac{-9}{0} \\ &= \text{undefined} \end{aligned}$$

The slope of *AB* is undefined. **(3 marks)**

4. **a.** The centre of the circle is equal to the midpoint of *XY*.

$$\begin{aligned} x_M &= \frac{x_1+x_2}{2} \\ &= \frac{7+1}{2} \\ &= \frac{8}{2} \\ &= 4 \end{aligned}$$

$$\begin{aligned} y_M &= \frac{y_1+y_2}{2} \\ &= \frac{3+(-5)}{2} \\ &= \frac{-2}{2} \\ &= -1 \end{aligned}$$

The midpoint of *XY* is $(4,-1)$.

Therefore, the centre of the circle is $(4,-1)$. **(3 marks)**

b. **Step1:** Find the length of the diameter, *XY*.

$$\begin{aligned} XY &= \sqrt{(x_2-x_1)^2+(y_2-y_1)^2} \\ &= \sqrt{(7-1)^2+[3-(-5)]^2} \\ &= \sqrt{6^2+(3+5)^2} \\ &= \sqrt{36+8^2} \\ &= \sqrt{36+64} \\ &= \sqrt{100} \\ &= 10 \end{aligned}$$

The diameter is 10 units long.

Step 2: Find the length of the radius.

The radius is half the diameter.

$$0.5 \times 10 = 5$$

Therefore, the radius is 5 units long. **(3 marks)**

5. **a.** The slope of a line segment parallel to line *AB* is $\frac{4}{5}$. **(1 mark)**

b. The slope of a line segment perpendicular to line *AB* is $-\frac{5}{4}$. **(1 mark)**

6. **Step 1:** Determine the slope of *AB*.

$$\begin{aligned} \text{Slope} &= \frac{y_2-y_1}{x_2-x_1} \\ &= \frac{6-2}{4-(-5)} \\ &= \frac{4}{4+5} \\ &= \frac{4}{9} \end{aligned}$$

Step 2: Determine the slope of *BC*.

$$\begin{aligned} \text{Slope} &= \frac{y_2-y_1}{x_2-x_1} \\ &= \frac{6-(-2)}{4-6} \\ &= \frac{6+2}{-2} \\ &= \frac{8}{-2} \\ &= -4 \end{aligned}$$

Step 3: Check to see if the product of the slopes is -1.

$$\frac{4}{9} \times (-4) \neq -1$$

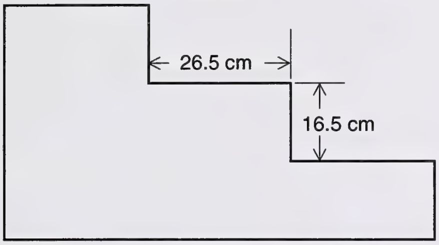
No, the triangle is not a right triangle because the product of the slopes does not equal -1. **(5 marks)**

7. Textbook exercises 1 to 4 of Part A of "What Should I Be Able To Do?" p. 249

Answers will vary. Sample answers are given.

1. The sample staircase has a run of 26.5 cm and a rise of 16.5 cm.

2.



3.

$$\begin{aligned}\text{Ideal} &= \text{run} + 2 \times \text{rise}\\ &= 620\ \text{mm}\end{aligned}$$

$$\begin{aligned}\text{Sample} &= 265 + 2 \times 165\\ &= 265 + 330\\ &= 595\end{aligned}$$

$26.5\ \text{cm} = 265\ \text{mm}$

$16.5\ \text{cm} = 165\ \text{mm}$

The result for the sample is 595 mm.

It does not fit Blondel's rule because the measurements of the run plus twice the rise does not equal 620 mm.

4. The CMHC recommends a maximum rise of 200 mm (or 20 cm) and a minimum run of 250 mm (or 25 cm). This staircase meets these recommendations. The rise of 16.5 cm (or 165 mm) is under the maximum rise, and the run of 26.5 cm (or 265 mm) is over the minimum run.

(10 marks)

Module 6: Linear Functions

Overview

This module focuses on a project that contrasts two species.

Skills and concepts include the following:

- graphing functions
- applying linear functions to direct variations, arithmetic sequences, and relations in real-life contexts
- determining the equation of a line
- determining the equation of an estimated line of best fit, the median-median line of best fit, and the line of best fit based on the least squares method
- determining the correlation coefficient for sets of data and interpreting the resulting values

Evaluation

The evaluation of this module will be based on a project and an assignment. These will be weighted as follows:

Module Project	**30 marks**
Module Assignment	**70 marks**
TOTAL	**100 marks**

Module 6: Project Booklet Answer Key (30 marks)

1. Answers will vary according to the persons measured. Sample responses are given.

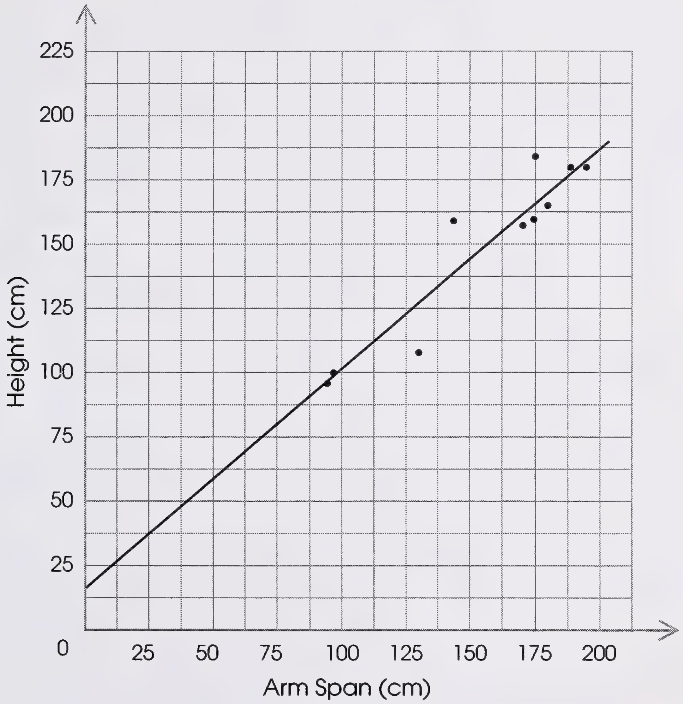
a. **Comparing Arm Span and Height of Humans**

Name	Arm Span (cm)	Height (cm)
Aladdin	170	158
Arif	180	165
Bill	140	160
Debbie	173	160
Eldon	187	180
Meghan	175	182
Pat	195	180
Tyrel	96	100
Udham	95	92
Wayne	130	110

(2 marks)

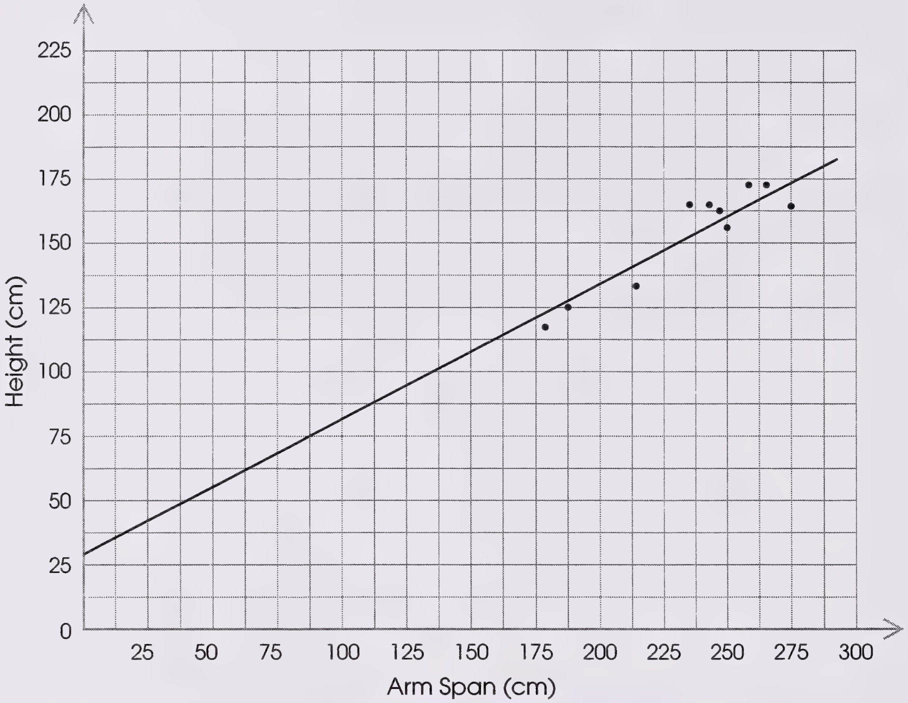
b. Answers will vary. Check for accuracy of the scatterplot. Axes should be labelled and appropriate tick marks made.

The scatterplots for the data on humans may be similar to the following.



(3 marks)

2. The scatterplot and estimated line of best fit for gorillas may look as follows.



(3 marks)

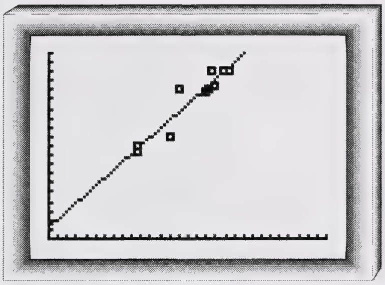
3. A suitable WINDOW setting is as follows. The *x*-values represent arm span; the *y*-values represent height.

Xmin = 0
Xmax = **300**
Xscl = **10**
Ymin = 0
Ymax = **200** ◄— The Ymax may vary if the student measures a person over 200 cm.
Yscl = **10**
Xres = 1

(3 marks)

4. **a.** The line of best fit generated by the calculator and the estimated line of best fit will differ slightly.

Note: For the sample human data given in the suggested answers, the calculator scatterplot and line of best fit look like the following.

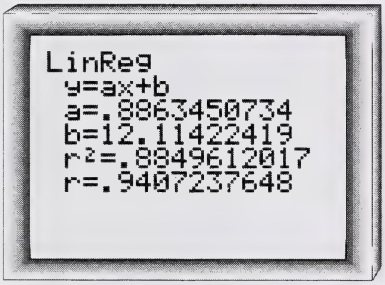


(2 marks)

b. Answers may vary. The following response is based on the sample human data given in the suggested answers.

The equation is about $y = 0.89x + 12.11$. The correlation coefficient is about 0.94.

Note: The equation of the line of best fit and the correlation coefficient for the sample human data given in the suggested answers is as follows.



```
LinReg
 y=ax+b
 a=.8863450734
 b=12.11422419
 r²=.8849612017
 r=.9407237648
```

(2 marks)

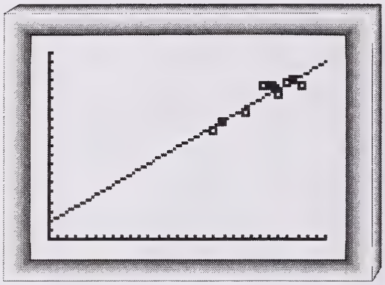
c. Answers may vary. The following response is based on the sample human data given in the suggested answers.

$$\begin{aligned} y &\doteq 0.89x + 12.1 \\ 198 &\doteq 0.89x + 12.1 \\ 185.9 &\doteq 0.89x \\ x &\doteq 209 \end{aligned}$$

Michael Jordan's arm span is about 209 cm. **(2 marks)**

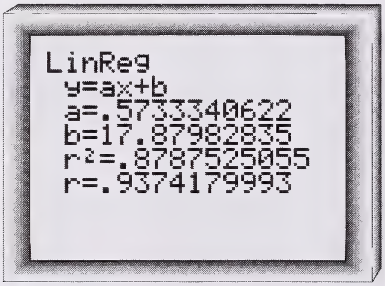
5. **a.** The line of best fit generated by the calculator and the estimated line of best fit will differ slightly.

Note: For the sample gorilla data, the calculator scatterplot and line of best fit look like the following.



(2 marks)

b. The equation of the line of best fit and the correlation coefficient for the data on gorillas is as follows.



```
LinReg
 y=ax+b
 a=.5733340622
 b=17.87982835
 r²=.8787525055
 r=.9374179993
```

The equation is about $y = 0.57x + 17.88$. The correlation coefficient is about 0.94. **(2 marks)**

c. Determine Koko's expected arm span.

$$\begin{aligned} y &\doteq 0.57x + 17.88 \\ &\doteq 0.57(172.5) + 17.88 \\ &\doteq 116 \end{aligned}$$

Koko's expected arm span is about 116 cm.

Determine Ndume's expected arm span.

$$\begin{aligned} y &\doteq 0.57x + 17.88 \\ &\doteq 0.57(180) + 17.88 \\ &\doteq 120 \end{aligned}$$

Ndume's expected arm span is about 120 cm.

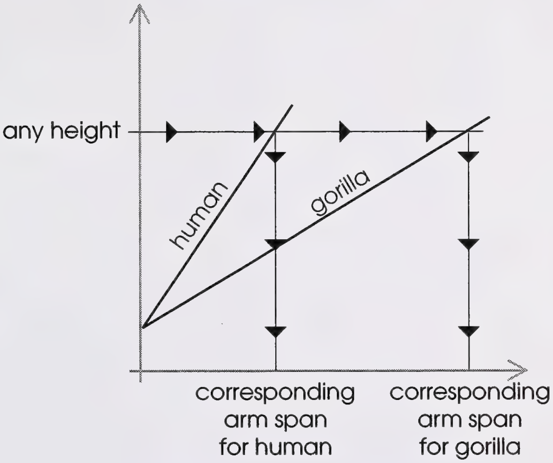
(2 marks)

6. The correlation coefficient for height and arm-span data of the samples are close to 1 for both species. Therefore, both sets of data can be approximated very closely by a linear function. **(1 mark)**

7. For the samples used, the gorillas have the greater arm span.

The line of best fit is farther to the right for the gorillas. This indicates that for a given height, the arm span for a gorilla will be greater than that for a human.

Note: The explanation should be based on the following concept.


any height
human
gorilla
corresponding arm span for human
corresponding arm span for gorilla

(2 marks)

8. Answers will vary. Accept any reasonable inference.

- The longer arms allow the gorilla to walk on all four limbs.
- The longer arms allow the gorilla to reach food more easily.

(1 mark)

9. Answers will vary. The response may have content similar to the following.

Feature	How Feature Helps
Almost completely covered by hair	• Protection from cold, sunlight • Protection from cuts and abrasions
Sensitive nose	• Detects food • Detects predators
Large molars	• Process large amounts of vegetation in diet

(3 marks)

Module 6: Assignment Booklet Answer Key (70 marks)

1. C **(1 mark)**

2. C **(1 mark)**

3. A **(1 mark)**

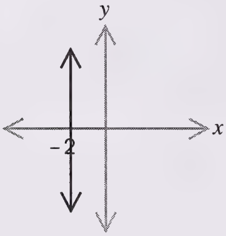
4. **a.** $x = 4$ **(1 mark)**

   b. $y = 6$ **(1 mark)**

   c.
$$\begin{aligned} m &= \frac{\text{Rise}}{\text{Run}} \\ &= \frac{-6}{4} \\ &= -\frac{3}{2} \end{aligned}$$
(2 marks)

   d. $y = -\frac{3}{2}x + 6$ **(1 mark)**

5. The graph of $x = -2$ is a vertical line that crosses the x-axis at -2.



(2 marks)

6. **a.** The linear function is $y = 4x - 1$, where $x = 1, 2, 3, \dots$. **(1 mark)**

   b.

x	y
1	3
2	7
3	11
4	$4(4) - 1 = 15$
5	$4(5) - 1 = 19$
6	$4(6) - 1 = 23$

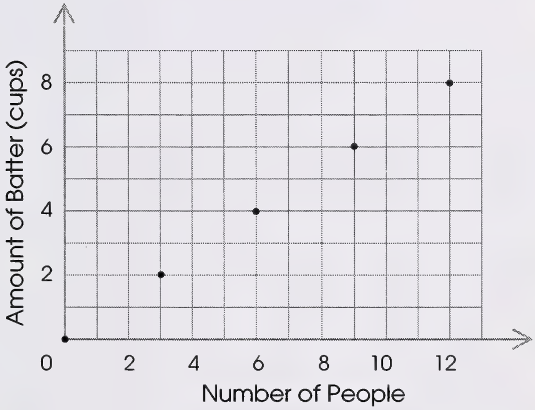
The next three terms are 15, 19, and 23. **(2 marks)**

7. a. Textbook exercise 4.a. of "Exercises: Checking Your Skills," p. 279

4. a. The table of values should look like the following.

Number of People	Amount of Batter (cups)
0	0
3	2
6	4
9	6
12	8

A graph of the relation will look as follows.



(2 marks)

b. Textbook exercises 4.b., 4.c., and 4.d. of "Exercises: Checking Your Skills," p. 279

4. b. The domain of the relation is the natural numbers 1, 2, 3, ….

c. Serving 30 people takes 5 times the batter needed for 6 people, since a direct variation is involved.

$4 \times 5 = 20$

You must prepare 20 cups of batter for 30 people.

d. The amount of batter varies directly with the number of people. Because 4 cups serves 6 people, 12 cups will serve 18 people. Three times the amount of batter will serve 3 times the number of people.

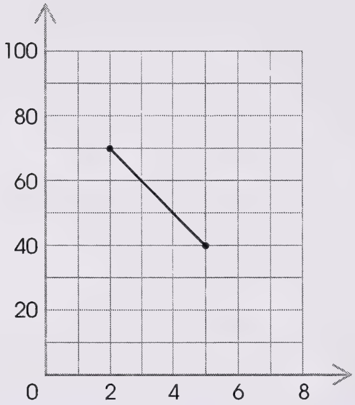
(3 marks)

8. The y-intercept is 2.

$$\text{Slope} = \frac{\text{Rise}}{\text{Run}}$$
$$= \frac{5}{2}$$

$\therefore\ y = \frac{5}{2}x + 2$ **(2 marks)**

9. The y-intercept is 90.



$$\text{Slope} = \frac{\text{Rise}}{\text{Run}}$$
$$= \frac{-30}{3}$$
$$= -10$$

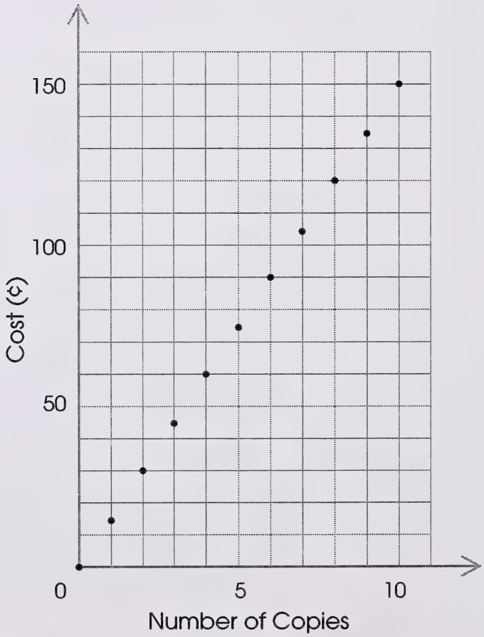
$\therefore\ y = -10x + 90$ **(3 marks)**

10. **a.** The table of values should look like the following.

Number of Copies	Cost (¢)
0	0
1	15
2	30
3	45
4	60
5	75
6	90
7	105
8	120
9	135
10	150

(2 marks)

b. The graph of the function will look as follows.



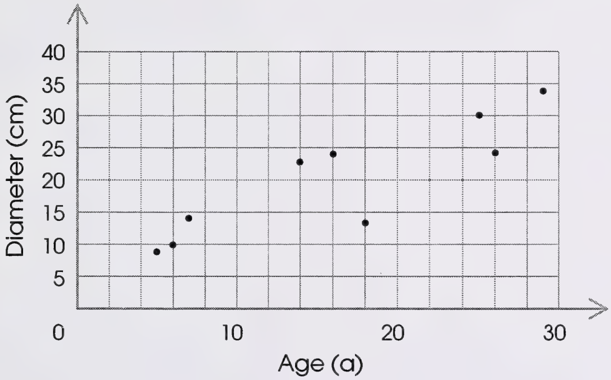
(3 marks)

c. Let y be the cost in cents and x be the number of copies.

Then $y = 15x$. **(2 marks)**

d. The domain is the set of whole numbers, $\{0, 1, 2, \ldots\}$. **(1 mark)**

11. a. The scatterplot should look like the following. **Note:** Additional information relating to parts b. and c. will also appear in the students' graphs.

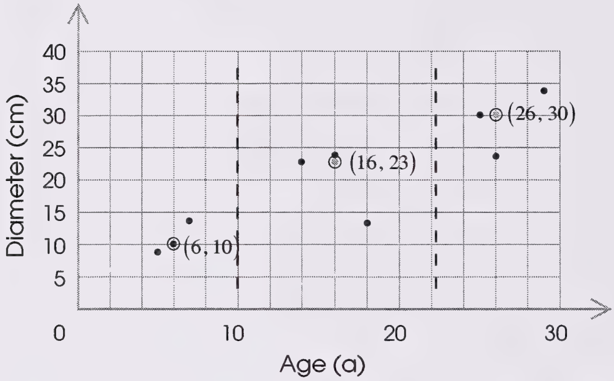


(3 marks)

b. Students may show the ordered pairs (put in ascending order) for each group. The middle value of each x-value and y-value in each group forms the summary point of that group.

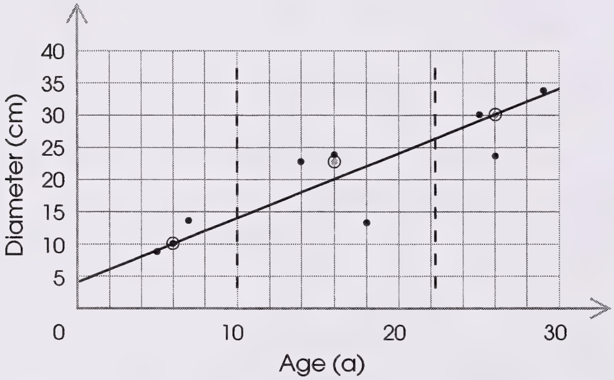
	Age **x (years)**	**Diameter** **y (cm)**	**Summary Point**
First Group	5 ⑥ 7	8 ⑩ 14	$(6, 10)$
Second Group	14 ⑯ 18	㉓ 24 13	$(16, 23)$
Third Group	25 ㉖ 29	㉚ 24 34	$(26, 30)$

Students may show the data divided into three groups on the graph in part a. The summary points may be circled and labelled.



(6 marks)

c. The line through the outer summary points looks like the following.



To determine the equation of the line through the outer summary points, students must first calculate the slope and y-intercept.

$$\begin{aligned}\text{Slope} &= \frac{y_2 - y_1}{x_2 - x_1}\\ &= \frac{30-10}{26-6}\\ &= \frac{20}{20}\\ &= 1\end{aligned}$$

$$\begin{aligned}y &= mx + b\\ 10 &= (1)6 + b\\ 10 &= 6 + b\\ b &= 4\end{aligned}$$

The equation of the line through the outer summary points is $y = x + 4$. **(4 marks)**

d. Find the y-value of the line at $x = 16$.

$$\begin{aligned} y &= x + 4 \\ &= 16 + 4 \\ &= 20 \end{aligned}$$

The vertical distance from the line through the outer summary points to the middle summary point is $23 - 20 = 3$. **(3 marks)**

e. The median-median line of best fit is parallel to the line through the outer summary points, but is $\frac{1}{3}$ of the distance toward the middle summary point.

$$\frac{1}{3} \times 3 = 1$$

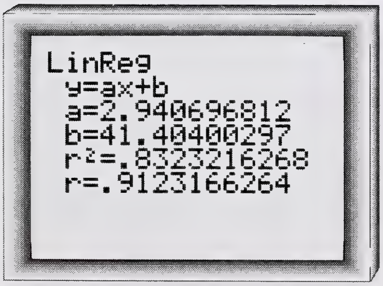
The median-median line runs through $(16, 21)$.

$$\begin{aligned} y &= x + b \\ 21 &= 16 + b \\ b &= 5 \\ y &= x + 5 \end{aligned}$$

The equation of the median-median line of best fit is $y = x + 5$. **(3 marks)**

f. The slope indicates the rate at which the diameter increases. It indicates the annual increase in the diameter measured in centimetres. The slope of 1 indicates that the diameter increases by 1 cm each year. **(2 marks)**

12. a.

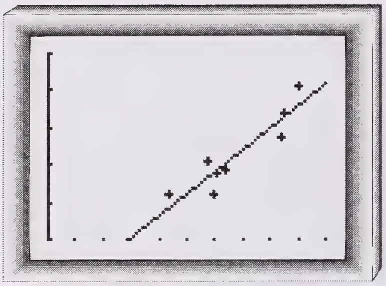


```
LinReg
 y=ax+b
 a=2.940696812
 b=41.40400297
 r²=.8323216268
 r=.9123166264
```

The correlation coefficient is about 0.91.

The equation of the line of best fit is about $y = 2.94x + 41.40$. **(2 marks)**

b. The scatterplot and line of best fit will look as follows.



(5 marks)

c. The data can be represented "very closely" by a linear function. This is indicated by the closeness of the correlation coefficient to 1. All the data points are close to the line of best fit. **(2 marks)**

d. According to the data, more study time is likely to result in better marks in a science test. **(2 marks)**

e. Answers will vary. Possible questions could be as follows:

- Does the data for the remaining students support the trend of the sample data?
- Why didn't the data include the results for all 23 students?

(1 mark)

13. a. No, the relation does not appear to be a linear function. The scatterplot indicates that data is widely dispersed and not close to any one line. **(2 marks)**

b. The correlation coefficient of 0.17 is almost zero. A correlation coefficient close to zero indicates that the data does not fit a linear model. **(2 marks)**

14. Methods chosen may vary. Following is a sample response.

In order for $r = 1$ to be true, the data must be linear.

The points $(2, 6)$ and $(8, 9)$ are on the line $y = \frac{1}{2}x + 5$ or $y = 0.5x + 5$.

In order for the data to be linear, the remaining point must lie on the line $y = \frac{1}{2}x + 5$. Find the *y*-value when $x = 4$.

$$\begin{aligned} y &= \frac{1}{2}(4) + 5 \\ &= 7 \end{aligned}$$

The other point must be $(4, 7)$.

The missing value in the table must be 7. **(2 marks)**

Module 7: Trigonometry

Overview

This module involves indirect measurement and using trigonometry to determine values that cannot be measured directly. The skills and concepts that are required to complete the calculations are introduced throughout the module. The project for this module includes constructing angle-measuring devices, making measurements of distances and angles, and using trigonometry to determine measurements that cannot be determined directly.

Skills and concepts include the following:

- researching instruments used to survey a plot of land
- using right-angle trigonometry to determine values for indirect measurements
- constructing simple survey instruments and using them to determine the height of a tall object and the boundaries of a plot of land
- solving problems requiring two right triangles
- extending the concepts of sine and cosine for angles from 0° to 180°
- studying the Sine Law and solving problems involving the Sine Law
- studying the Cosine Law and solving problems involving the Cosine Law
- solving problems involving the application of both the Sine Law and Cosine Law as well as the trigonometric ratios

Evaluation

The evaluation of this module will be based on a project and an assignment. These will be weighted as follows:

Module Project	**40 marks**
Module Assignment	**60 marks**
TOTAL	**100 marks**

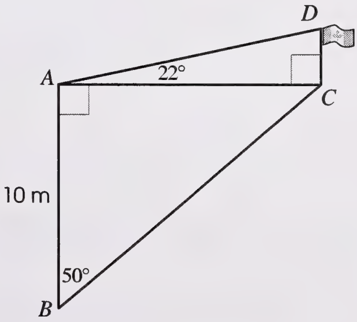
Module 7: Project Booklet Answer Key (40 marks)

1. **a.** Answers will vary. The following is a sample calculation using two triangles. The diagram is similar to that on page 330 of the textbook.

The measurements are as follows: $\angle A = 22°$, $\angle B = 50°$, $AB = 10$ m.

Label the point at the base of the flagpole C.

Find the length of side AC.



$$\tan \angle B = \frac{\text{length of opposite side}}{\text{length of adjacent side}}$$

$$\tan 50° = \frac{AC}{10}$$

$$AC = 10 \tan 50°$$

$$\doteq 11.9$$

Side AC is about 11.9 m.

Find the height of the flagpole.

$$\tan \angle A = \frac{\text{length of opposite side}}{\text{length of adjacent side}}$$

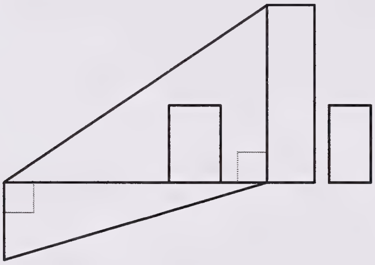
$$\tan 22° \doteq \frac{DC}{11.9}$$

$$DC \doteq 11.9 \tan 22°$$

$$\doteq 4.8$$

The height of the flagpole is about 4.8 m. **(7 marks)**

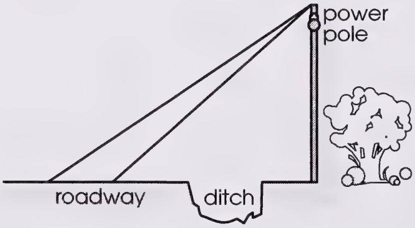
b. This method would be useful when it is impossible to measure directly the distance to the base of a structure because other structures are in the way, as shown in the following diagram.



(3 marks)

2. **a.** Answers will vary. The solution will use the Sine Law and will include similar calculations to those in Example 1 on pages 368 and 369 of the *Addison-Wesley Applied Mathematics 10 Source Book.* **(7 marks)**

b. This method would be useful when it is impossible to measure directly the distance to the base of a structure because the object is inaccessible, as shown in the following diagram.



(3 marks)

3. **a.** Answers will vary. Data should include measures of all sides, angles, and distances to objects, buildings, trees, and other structures on the chosen plot of land. **(5 marks)**

b. Students' drawings should include the various buildings, trees, and other objects on the plot of land. Students should label their drawings and include all measurements. The scale should be indicated. **(10 marks)**

4. Answers will vary. The summary report should describe how the students proceeded with the survey, what they learned from doing the survey, and what mathematical concepts they had to apply to complete the project. **(5 marks)**

Module 7: Assignment Booklet Answer Key (60 marks)

1. $\sin \angle X = \frac{x}{z}$, $\cos \angle X = \frac{y}{z}$, $\tan \angle X = \frac{x}{y}$ **(3 marks)**

2. Students may use various strategies to find the measurements. One example follows.

Step 1: Since ΔEFG is a right triangle, you can use the tangent ratio to find the length of *EF*.

$$\begin{aligned}\tan 65^\circ &= \frac{FG}{EF}\\ \tan 65^\circ &= \frac{4.6}{EF}\\ EF &= \frac{4.6}{\tan 65^\circ}\\ &\doteq 2.1 \quad \longleftarrow \text{rounded to 1 decimal place}\end{aligned}$$

The length of *EF* is about 2.1 cm.

Step 2: Use the sine ratio to find the length of *EG*.

$$\begin{aligned}\sin 65^\circ &= \frac{FG}{EG}\\ \sin 65^\circ &= \frac{4.6}{EG}\\ EG &= \frac{4.6}{\sin 65^\circ}\\ &\doteq 5.1 \quad \longleftarrow \text{rounded to 1 decimal place}\end{aligned}$$

The length of *EG* is about 5.1 cm.

Step 3: Use the angle sum property to find the measure of $\angle G$.

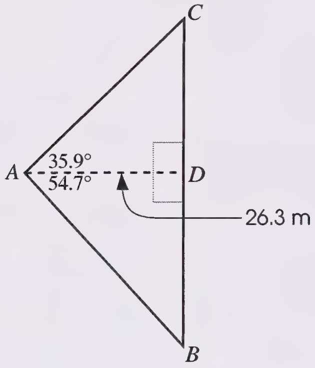
$$\begin{aligned}\angle G &= 180^\circ - (\angle F + \angle E)\\ &= 180^\circ - (90^\circ + 65^\circ)\\ &= 180^\circ - 155^\circ\\ &= 25^\circ\end{aligned}$$

The measure of $\angle G$ is 25°.
(3 marks)

3. **a.** To use the clinometer to measure the angle of elevation (or the angle of depression) to an object, you sight the object along the straw and read the angle where the plumb-bob string lines up with the angle measure on the scale. **(1 mark)**

   b. To use the transit to measure the horizontal angle between two objects, you position the transit so that the first object, the sighting strawing, and 0° are aligned. Then, turn the sighting straw until it is lined up with the second object. Read the angle with which the straw is lined up. **(1 mark)**

4. **Step1:** Draw and label a diagram to illustrate the problem.



The height of the taller building is equal to $BD + CD$.

Step 2: Find the length of BD.

$$\begin{aligned}\tan \angle BAD &= \frac{BD}{AD}\\ \tan 54.7^\circ &= \frac{BD}{26.3}\\ BD &= 26.3 \tan 54.7^\circ\\ &\doteq 37.14 \quad \longleftarrow \text{rounded to one place more than required}\end{aligned}$$

The length of BD is about 37.1 m.

Step 3: Find the length of CD.

$$\begin{aligned}\tan \angle CAD &= \frac{CD}{AD}\\ \tan 35.9^\circ &= \frac{CD}{26.3}\\ CD &= 26.3 \tan 35.9^\circ\\ &\doteq 19.04 \quad \longleftarrow \text{rounded to one place more than required}\end{aligned}$$

The length of CD is about 19.0 m.

Step 4: Find the height of the taller building.

$$\begin{aligned}\text{height} &= BD + CD\\ &= 37.14 + 19.04\\ &\doteq 56.2\end{aligned}$$

The height of the taller building is about 56.2 m. **(6 marks)**

5. The fire that was observed at an angle of depression of 3° is farther away. The smaller the angle of depression, the farther away the object that is sighted. **(3 marks)**

6. **a.** $\sin 23° = 0.3907$ $\cos 23° = 0.9205$ **(2 marks)**

b. $\sin 137° = 0.6820$ $\cos 137° = -0.7314$ **(2 marks)**

c. $\sin 86° = 0.9976$ $\cos 86° = 0.0698$ **(2 marks)**

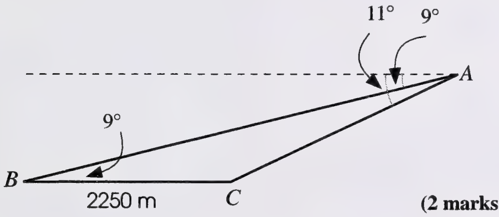
7. **a.** $\sin 42° = \sin 138°$ **b.** $\cos 74° = -\cos 106°$

c. $\sin 156° = \sin 24°$ **d.** $\cos 121° = -\cos 59°$

(4 marks)

8. The Sine Law states that the ratio of one side of a triangle to the sine of the angle opposite that side is equal to the ratio of either of the other two sides to the sine of its opposite angle. **(2 marks)**

9. **a.** Draw and label a diagram to illustrate the situation.



(2 marks)

b. Determine the measures of any angles required.

$\angle A = 11° - 9°$ ⟵ difference in angles of depression

$= 2°$

$\angle C = 180° - (\angle B + \angle A)$ ⟵ angle sum property

$= 180° - (9° + 2°)$

$= 180° - 11°$

$= 169°$

$\angle B = 9°$ ⟵ alternate angle

(3 marks)

c. Use the Sine Law to determine how far the airplane is from the runway.

$$\frac{c}{\sin C} = \frac{a}{\sin A}$$

$$\frac{c}{\sin 169^\circ} = \frac{2250}{\sin 2^\circ}$$

$$c = \frac{2250 \sin 169^\circ}{\sin 2^\circ}$$

$$\doteq 12\ 302$$

The airplane is about 12 302 m from the far end of the runway. **(3 marks)**

10. **Step 1:** Use the Sine Law to find $\sin B$.

$$\frac{\sin B}{b} = \frac{\sin C}{c}$$

$$\frac{\sin B}{16} = \frac{\sin 82^\circ}{28}$$

$$\sin B = \frac{16 \sin 82^\circ}{28}$$

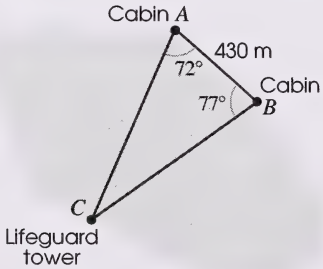
$$= 0.565\ 867\ 467\ 9$$

Step 2: Use the inverse of $\sin B$ to find the measure of $\angle B$.

$$\angle B \doteq 34^\circ$$

The measure of $\angle B$ is about 34°. **(3 marks)**

11. **a.** The diagram to illustrate the problem should be similar to the following.



(2 marks)

b. **Step 1:** Use the angle sum property to find the measure of $\angle C$.

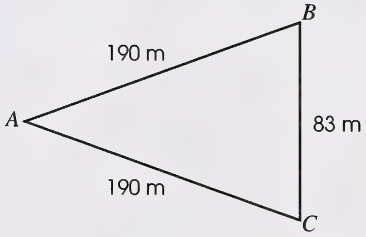
$$\begin{aligned}\angle C &= 180^\circ - (\angle A + \angle B)\\ &= 180^\circ - (72^\circ + 77^\circ)\\ &= 180^\circ - 149^\circ\\ &= 31^\circ\end{aligned}$$

Step 2: Use the Sine Law to find the distance from cabin A to the tower.

$$\begin{aligned}\frac{b}{\sin B} &= \frac{c}{\sin C}\\ \frac{b}{\sin 77^\circ} &= \frac{430}{\sin 31^\circ}\\ b &= \left(\frac{430}{\sin 31^\circ}\right)\sin 77^\circ\\ &\doteq 813\end{aligned}$$

The distance from cabin A to the lifeguard tower is about 813 m. **(3 marks)**

12. **Step 1:** Use the Cosine Law to find $\angle A$.



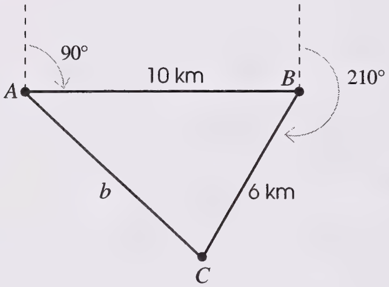
$$\begin{aligned}a^2 &= b^2 + c^2 - 2bc\cos A\\ 83^2 &= 190^2 + 190^2 - 2(190)(190)\cos A\\ \frac{83^2 - 190^2 - 190^2}{-2(190)(190)} &= \cos A\\ \cos A &= 0.904\,584\,487\,5\end{aligned}$$

Step 2: Use the inverse of $\cos A$ to find the measure of $\angle A$.

$$\angle A \doteq 25^\circ$$

The maximum angle through which the golfer can hit her drive is about 25°. **(3 marks)**

13. **Step 1:** Draw and label a diagram to illustrate the situation.



$$\begin{aligned} \angle B &= 270° - 210° \\ &= 60° \end{aligned}$$

Step 2: Find the distance from C back to the dock. Use the Cosine Law.

$$\begin{aligned} b^2 &= a^2 + c^2 - 2ac\cos B \\ b^2 &= 6^2 + 10^2 - 2(6)(10)\cos 60° \\ b^2 &= 76 \\ b &= \sqrt{76} \end{aligned}$$

Step 3: Find the time necessary to return to the dock.

$$\begin{aligned} \text{Time} &= \frac{\text{distance}}{\text{speed of boat}} \\ &\doteq \frac{\sqrt{76}\ \text{km}}{15\ \text{km}/60\ \text{min}} \\ &\doteq 35 \end{aligned}$$

The time necessary to return to the dock is about 35 min.

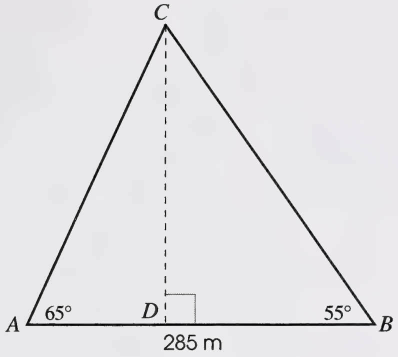
Step 4: Find the time available for fishing.

They have 3 h or 180 min before dark. They need about 35 min to return to the dock.

$$180 - 35 = 145$$

They have 145 min (or 2 h 25 min) to fish at this location. **(6 marks)**

14. **Step 1:** Draw and label a diagram to illustrate the problem.



The height of the balloon is the length of altitude CD, of $\triangle ABC$.

Step 2: Determine the measure of $\angle C$.

$$\begin{aligned}\angle C &= 180° - (\angle A + \angle B)\\ &= 180° - (65° + 55°)\\ &= 60°\end{aligned}$$

Step 3: Find the length of CA. Use the Sine Law.

$$\begin{aligned}\frac{b}{\sin B} &= \frac{c}{\sin C}\\ \frac{b}{\sin 55°} &= \frac{285}{\sin 60°}\\ b &= \frac{285 \sin 55°}{\sin 60°}\\ &\doteq 270\end{aligned}$$

Side CA is about 270 m.

Step 4: Find the length of side CD. Use the sine ratio.

$$\begin{aligned}\sin A &= \frac{CD}{CA}\\ \sin 65° &\doteq \frac{CD}{270}\\ CD &\doteq 270 \sin 65°\\ &\doteq 244\end{aligned}$$

The height of the hot-air balloon is about 244 m. **(6 marks)**

Final Test

Security
Included here is the answer key to the Final Test and the student's copy of the Final Test. Teachers should keep these secure against unauthorized student access. Students should not have access to the test until it is assigned in a supervised situation. The answers should be stored securely and retained by the teacher at all times.

Note: Before the students begin writing this test, ensure that students are using only approved graphing calculators, and ensure that students have cleared their calculators of all stored information. Information about clearing approved calculators can be found on the following website:

http://www.learning.gov.ab.ca/studenteval/

Click on "Requirements for Clearing Approved Calculators."

APPLIED MATHEMATICS 10

FINAL TEST ANSWER KEY

Total (100 marks)

1. Answers will vary. The estimate could be made by counting the number of paces and multiplying by the length of a pace. Alternatively, the estimate could be made by counting the number of tiles in a line and multiplying this number by the length of a tile. **(2 marks)**

2. **a.** It would be reasonable to use a trundle wheel. The trundle wheel would give an accurate measurement. The precision is adequate for this situation. **(1 mark)**

   b. It would not be reasonable to measure the distance between bases with a yardstick. In a baseball diamond, the distance between each base is about 90 feet (or 30 yards). You would lose precision (repeatability) and accuracy because you would have to reposition the yardstick several times. **(1 mark)**

3. **a.** The instrument has poor accuracy. There will be a consistent error of $+0.03$ mm. **(1 mark)**

   b. Each division represents $\frac{1}{128}$ of an inch. **(1 mark)**

4. **a.** $6:12=1:2$ **(1 mark)**

   b. $1^2:2^2=1:4$ **(1 mark)**

   c. $1^3:2^3=1:8$ **(1 mark)**

5.
$$1 \text{ foot} = \frac{1}{3} \text{ yard}$$
$$1 \text{ square foot} = \frac{1}{9} \text{ square yard}$$
$$5\,200\,000 \text{ square feet} = 577\,777.8 \text{ square yards}$$

The West Edmonton Mall covers about 577 777.8 square yards. **(1 mark)**

6. **a.**
$$\begin{aligned} S &= \pi d^2 \\ &= \pi(20.9)^2 \\ &\doteq 1372 \end{aligned}$$

Rounded to the nearest whole number, the surface area of the volleyball is 1372 cm^2. **(2 marks)**

   b.
$$\begin{aligned} V &= \frac{1}{6}\pi d^3 \\ &= \frac{1}{6}\pi(20.9)^3 \\ &\doteq 4780 \end{aligned}$$

Rounded to the nearest whole number, the volume of the volleyball is 4780 cm^3. **(2 marks)**

7. A soap bubble takes on the shape having the least possible surface area to enclose a given volume of air. A sphere has the least surface area for a given volume. **(1 mark)**

8. In a recursive table, the values in a row in the table are dependent on the values in the previous row in the table. **(1 mark)**

9. a.

	A	B	C
1	Date	Minimum Wage ($/h)	Earnings for 40-h Week
2	November 1997	5.00	$200.00
3	November 1998	5.40	$216.00
4	November 1999	5.90	$236.00

(3 marks)

b. The formula in cell C2 is = **40 * B2** .

The formula in cell C3 is = **40 * B3** .

The formula in cell C4 is = **40 * B4** .
(3 marks)

c. No, each row is independent. **(1 mark)**

10. a.

	A	B	C	D	E
1	Year	Opening Value	Annual Interest Rate	Interest Payment	Closing Value
2	1991	$1500.00	6.5%	$97.50	$1597.50
3	1992	$1597.50	5.00%	$79.88	$1677.38
4	1993	$1677.38	5.75%	$96.45	$1773.83

(1 mark)

b. The formula in cell D4 is = **B4 * C4** .

The formula in cell E4 is = **B4 + D4** .
(2 marks)

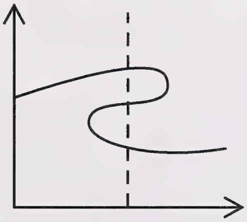
c. Yes, the values in rows 3 and 4 are dependent on the values in the preceding row. **(2 marks)**

11. Answers will vary. The spreadsheet can be easily changed to accommodate changes, such as a change in the amount of the loan or a change in the interest rate. A spreadsheet program automatically changes all the values when one value is changed, so it is a time-saving tool. **(2 marks)**

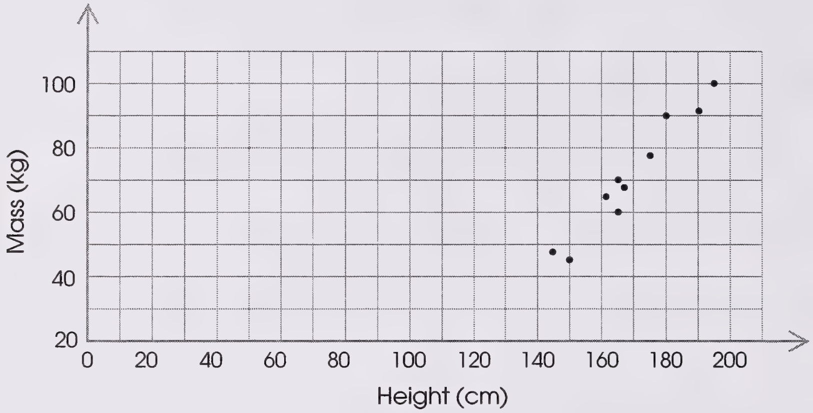
12. The horizontal portions indicate the temperature did not change. The portion of the line sloping up to the right indicates the temperature rose. The portion of the line sloping down to the right indicates the temperature fell.

The graph shows that the patient's temperature rose and then fell quickly and then remained fairly constant. **(2 marks)**

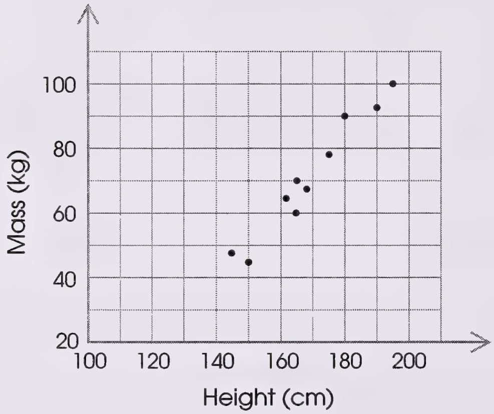
13. Answers will vary. An acceptable response is shown on the right. This relation is not a function because there is more than one y-value for some x-values. **(2 marks)**



14. **a.** Answers may vary. Following are two acceptable responses.



or



(3 marks)

b. Mass is related to height. As height increases, mass generally increases. A taller person tends to have more mass than a shorter person. **(1 mark)**

c. Answers will vary. Following is an acceptable response.

Xmin = 140 ← cannot be greater than 145
Xmax = 200 ← cannot be less than 195
Xscl = 10
Ymin = 40 ← cannot be greater than 42
Ymax = 100 ← cannot be less than 100
Yscl = 10
Xres = 1

(3 marks)

15. **a.**

$$\begin{aligned} C(p) &= 200 + 10p \\ C(300) &= 200 + 10 \times 300 \\ &= 200 + 3000 \\ &= 3200 \end{aligned}$$

The catering cost is \$3200. **(2 marks)**

b. The domain is the set of whole numbers from 0 to 300. The minimum number of people who will attend is 0. The maximum number is 300. The domain is restricted to whole numbers because it is not possible to have a fractional number of people.

The range is the set of whole numbers from 200 to 3200. The minimum catering cost is \$200. The maximum catering cost is \$3200. The range is restricted to whole numbers because no fractions are involved in the calculations. **(2 marks)**

16. **a.** The population consists of the students, parents, and staff at Central High. **(1 mark)**

b. The population consists of the residents of the City of Edmonton. **(1 mark)**

17. In order for a survey to be reliable, every member of the population must have an equal opportunity to be surveyed. (The population should be every Canadian.) In this survey, only the people listed in the Calgary phone book had an opportunity to be surveyed. Survey results would likely support the local or western teams. Therefore, the survey results are likely to be unreliable. **(2 marks)**

18. A systematic sampling method is being used. Every *n*th member of the population is chosen. **(1 mark)**

19. **a.** A self-selected sample is a sample in which only interested members of the population participate. The results may be biased because only people who have strong opinions may respond. **(2 marks)**

b. A convenience sample is a sample in which convenient members of the population are selected. For example, friends, teammates, relatives, or neighbours are sampled. Every member of the population does not have an equal chance of being selected. **(2 marks)**

20. **a.**

Line Segments	Length	Slope
AB	6	0
BC	5.8	$1\frac{2}{3}$
CD	6	0
AD	5.8	$1\frac{2}{3}$

(4 marks)

b. Yes, the opposite sides of the quadrilateral are parallel since the opposite line segments have the same slope. **(2 marks)**

c.

Diagonal	Slope	Midpoint
AC	$-\frac{5}{3}$	$\left(\frac{1}{2}, -1\frac{1}{2}\right)$
BD	$\frac{5}{9}$	$\left(\frac{1}{2}, -1\frac{1}{2}\right)$

(4 marks)

d. Yes, the diagonals cross at $\left(\frac{1}{2}, -1\frac{1}{2}\right)$, which is the midpoint of each line segment. **(2 marks)**

e. No, the slopes of the diagonals are not the negative reciprocal of each other. In other words, $\frac{-5}{3} \times \frac{5}{9} \neq 1$. **(2 marks)**

21. a.

$$5x + 25y = 300$$
$$\cancel{5}x - \cancel{5}x + 25y = -5x + 300$$
$$25y = -5x + 300$$
$$\frac{25y}{25} = \frac{-5x}{25} + \frac{300}{25}$$
$$y = -\frac{1}{5}x + 12$$

(2 marks)

b. x-intercept $= (60, 0)$ **(2 marks)**

y-intercept $= (0, 12)$ **(1 mark)**

22. a. The charge is 58¢, plus 7¢ per copy. **or** The charge is $0.58, plus $0.07 per copy.
or The charge is 65¢ for the first copy and 7¢ for each additional copy. **(2 marks)**

b. Let c be the cost and n be the number of copies.

$c(n) = 58 + 7n$ **or** $c(n) = 0.58 + 0.07n$ **(2 marks)**

c. $c(10) = 58 + 7(10)$ **or** $c(10) = 0.58 + 0.07(10)$

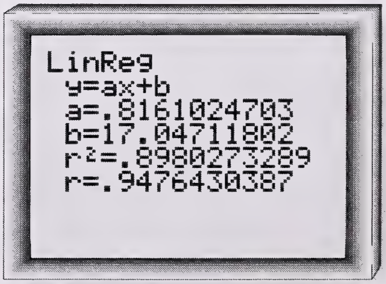
$= 58 + 70$ $\quad$ $= 0.58 + 0.70$

$= 128$ $\quad$ $= 1.28$

The cost is 128¢ or $1.28. **(2 marks)**

23. a. The caluclator display for obtaining the correlation coefficient is shown for information only.

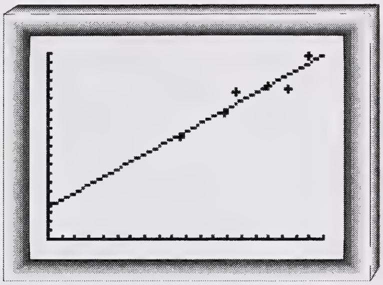
The correlation coefficient is about 0.95. **(2 marks)**



```
LinReg
 y=ax+b
 a=.8161024703
 b=17.04711802
 r²=.8980273289
 r=.9476430387
```

b. The data will fit a straight line very closely because the correlation coefficient is close to 1. The closer the correlation coefficient is to 1 or -1, the closer the data will fit the function, which, in this case, is a linear function. **(2 marks)**

c. The sketch should resemble the following calculator display.



(2 marks)

24. $\tan 39° = \frac{\text{opposite}}{\text{adjacent}}$

$$\tan 39° = \frac{y}{11.6}$$
$$y = 11.6 \tan 39°$$
$$\doteq 9.4$$

To the nearest tenth of a metre, Michael's floor is 9.4 m higher than Sandra's. **(3 marks)**

25. Use the Cosine Law.

$$b^2 = a^2 + c^2 - 2ac \cos B$$
$$b^2 = 3.7^2 + 2.1^2 - 2(3.7)(2.1)\cos 112°$$
$$b^2 \doteq 23.9$$
$$b \doteq \sqrt{23.9}$$
$$\doteq 4.9$$

Rounded to the nearest tenth of a metre, the distance between the boats is 4.9 km. **(3 marks)**

26. Fred and Mridula are apart by the distance of *AD* plus *DB*.

Find the length of *AD*.

$$\tan 50° = \frac{500}{AD}$$
$$AD = \frac{500}{\tan 50°}$$
$$= 419.5$$
$$\doteq 420$$

To the nearest metre, the length of *AD* is 420 m.

Find the length of DB.

$$\begin{aligned}\tan 75° &= \frac{500}{DB}\\ DB &= \frac{500}{\tan 75°}\\ &= 134.0\\ &\doteq 134\end{aligned}$$

To the nearest metre, the length of DB is 134 m.

Find the length of AB.

$$\begin{aligned}AB &= AD + DB\\ &\doteq 419.5 + 134.0\\ &\doteq 554\end{aligned}$$

Therefore, Fred and Mridula are about 554 m apart. **(4 marks)**

27. **a.** Use the angle sum property to find the measure of $\angle C$.

$$\begin{aligned}C &= 180° - (30° + 40°)\\ &= 110°\end{aligned}$$

The measure of $\angle C$ is 110°. **(1 mark)**

b. Use the Sine Law to find the length of side b (AC).

$$\begin{aligned}\frac{b}{\sin 40°} &= \frac{7.0}{\sin 110°}\\ b &= \sin 40°\left(\frac{7.0}{\sin 110°}\right)\\ &\doteq 4.8\end{aligned}$$

The length of AC is about 4.8 m. **(4 marks)**

Use the Sine Law to find the length of side a (BC).

$$\begin{aligned}\frac{a}{\sin 30°} &= \frac{7.0}{\sin 110°}\\ a &= \sin 30°\left(\frac{7.0}{\sin 110°}\right)\\ &\doteq 3.7\end{aligned}$$

The length of BC is about 3.7 m. **(2 marks)**

APPLIED MATHEMATICS 10

FINAL TEST

GENERAL INSTRUCTIONS

YOU HAVE **THREE** HOURS TO COMPLETE THIS TEST. Work through the entire test answering the questions you are sure you know. You will then be able to concentrate on the questions of which you are not quite sure.

TOTAL MARKS: 100

You may use any hand-held scientific calculator. Approved graphing calculators are listed as follows:

- *Texas Instruments* TI-83, TI-83 Plus, TI-82, TI-86, TI-89, TI-92, or TI-92 Plus
- *Casio* CFX-9850Ga-Plus, CFX-9850G, CFX-9800G, or FX-9700 series
- *Sharp* EL-9600c, EL-9600, EL-9300, or EL-9200

Note: Before beginning this Final Test, you must clear your calculator of all stored information.

Value

100

(2 marks) **1.** Explain how you would estimate the length of a hallway in a school.

2. The distance between bases on a baseball diamond must be 90 feet. Explain whether or not it is reasonable to measure the distance between the bases with each of the following measuring devices.

(1 mark) **a.** a digital trundle wheel calibrated in feet and inches

(1 mark) **b.** a yardstick with increments of $\frac{1}{16}$ of an inch

(1 mark) **3. a.** A micrometer consistently reads 0.03 mm when it is closed. Does this micrometer have poor precision or poor accuracy? Explain.

(1 mark) **b.** If the smallest division on the scale on the main arm of a vernier caliper is $\frac{1}{16}$ of an inch, and there are 8 divisions on the vernier scale, what does each division on the vernier scale represent?

4. Suppose you have a sphere with a diameter of 6 cm and a sphere with a diameter of 12 cm.

(1 mark) **a.** What is the ratio of the diameter of the smaller sphere to the diameter of the larger sphere?

(1 mark) **b.** What is the ratio of the surface area of the smaller sphere to the surface area of the larger sphere?

(1 mark) **c.** What is the ratio of the volume of the smaller sphere to the volume of the larger sphere?

(1 mark) **5.** The West Edmonton Mall covers 5 200 000 square feet. How many square yards does the mall cover? Round the area to the nearest tenth.

(2 marks) **6.** A volleyball has a diameter of 20.9 cm.

a. Use either the formula $S = \pi d^2$ or the formula $S = 4\pi r^2$ to calculate the surface area of the volleyball. Round the area to the nearest whole number.

(2 marks) **b.** Use either the formula $V = \frac{1}{6}\pi d^3$ or the formula $V = \frac{4}{3}\pi r^3$ to calculate the volume of the volleyball. Round the volume to the nearest whole number.

(1 mark) **7.** Explain why soap bubbles are usually spherical.

(1 mark) **8.** What is meant when the rows in a table are related recursively?

(3 marks) **9. a.** The following spreadsheet shows the minimum wage in Alberta in November of 1997, 1998, and 1999. Complete the table to include the earnings for a 40-h week at each given minimum wage.

	A	B	C
1	Date	Minimum Wage ($/h)	Earnings for 40-h Week
2	November 1997	5.00	
3	November 1998	5.40	
4	November 1999	5.90	

(3 marks) **b.** Write the formulas you used to complete cell C2, cell C3, and cell C4.

(1 mark) c. Are the rows in the spreadsheet related recursively? Explain.

(1 mark) **10.** **a.** Nolan purchased a Canada Savings bond for $1500.00 in 1991. Complete the following spreadsheet to show the interest payment and the closing value in 1993.

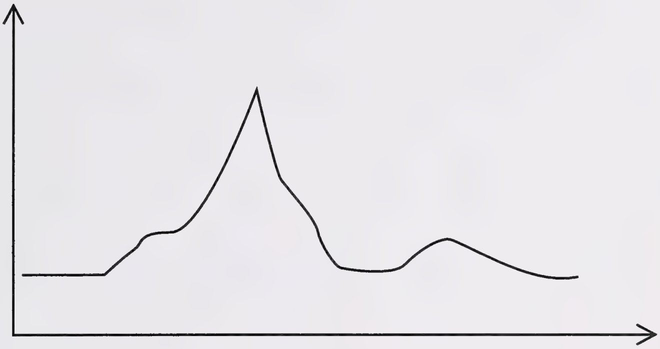
	A	B	C	D	E
1	Year	Opening Value	Annual Interest Rate	Interest Payment	Closing Value
2	1991	$1,500.00	6.50%	$97.50	$1,597.50
3	1992	$1,597.50	5.00%	$79.88	$1,677.38
4	1993	$1,677.38	5.75%		

(2 marks) **b.** Write the formulas used to complete cell D4 and cell E4.

(2 marks) **c.** Are the rows in the spreadsheet related recursively? Explain.

(2 marks) **11.** Why are spreadsheets useful when calculating complicated loan problems?

(2 marks) **12.** The given graph shows the relationship between a patient's temperature and the time of day.



Indicate how different portions of the graph represent aspects of the situation.

(2 marks) **13.** Sketch a graph that represents a relation that is not a function. Explain why the relation is not a function.

14. Members of a school mathematics club had themselves weighed for mass and measured for height. Their results were tabulated as follows.

Height (cm)	145	165	180	161	195	150	175	158	190	164
Mass (kg)	48	70	90	65	100	45	78	65	92	60

(3 marks) **a.** Draw a scatterplot of the data. Label the axes and show values on the axes.

(1 mark) **b.** Indicate what the data tells about the relation between height and mass for this group of students.

(3 marks) c. Indicate an appropriate WINDOW setting for a graphing calculator so that the all the data points are displayed. **Note:** Ensure that the set of data points would not bunched together, and the ticks for the scales would be easy to distinguish.

Xmin =

Xmax =

Xscl =

Ymin =

Ymax =

Yscl =

Xres =

15. A dinner for a family reunion is planned at a community hall, which can accommodate a maximum of 300 people.

The caterer charges a set-up fee of \$200, plus \$10 per person.

The catering cost, C, in dollars, is a function of the number of people attending, p, and is given by the equation $C(p) = 200 + 10p$.

(2 marks) a. Determine the catering cost if 300 people attend the dinner. In other words, determine $C(300)$.

(2 marks) **b.** State the domain and range of the function, and explain any restrictions on the domain or range.

16. Identify the population that you would sample for an opinion on the following questions:

(1 mark) **a.** Should the students at Central High School wear uniforms?

____

____

(1 mark) **b.** Should licences be required for cat owners in the City of Edmonton?

____

____

(2 marks) **17.** To assess the opinion of Canadians regarding which hockey team will win the Stanley Cup this year, researchers conducted telephone interviews of 100 people selected from the Calgary telephone book. Comment on the reliability of the survey results.

____

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(1 mark) **18.** The staff members of a high school newspaper decide to survey the students on the following question: Should classes in this school be divided according to gender? The newspaper staff members interview every tenth student who enters the school. Which sampling method are the staff members using?

____

____

19. Describe each of the following sampling methods and explain why each may produce biased results.

(2 marks) **a.** self-selected sample

____

____

____

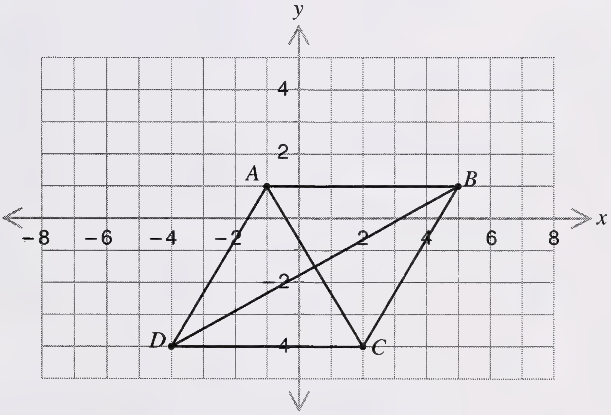
(2 marks) **b.** convenience sample

____

____

____

20. Quadrilateral $ABCD$ has vertices $A(-1, 1)$, $B(5, 1)$, $C(2, -4)$, and $D(-4, -4)$.



(4 marks) **a.** Determine the length and slope of each side of the quadrilateral. Round each length to the nearest tenth.

Line Segments	Length	Slope
AB		
BC		
CD		
AD		

(2 marks) **b.** Is quadrilateral *ABCD* a parallelogram? Justify your answer.

____

____

____

(4 marks) **c.** Determine the slope and midpoint of each diagonal in quadrilateral *ABCD*.

Diagonal	Slope	Midpoint
AC		
BD		

(2 marks) **d.** Do the diagonals bisect each other? Justify your answer.

____

____

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(2 marks) **e.** Are the diagonals perpendicular to each other? Justify your answer.

____

____

____

21. Jacqui has \$3.00 in change. The coins consist of nickels and quarters. If x is the number of nickels, and y is the number of quarters, the following equation gives the relation between the possible numbers of nickels and quarters.

$$5x + 25y = 300$$

(2 marks) **a.** Rewrite the equation in the form of $y =$. Show your work.

b. Determine the following for the relation:

(2 marks)
- x-intercept

(1 mark)
- y-intercept

22. A shop had the following chart to indicate photocopying charges.

Number of Copies	Charge ($)
1	0.65
2	0.72
3	0.79
4	0.86
5	0.93

The shop owner wanted an equation based on the relation indicated by the chart so that the charge for the occasional job that was greater than 5 copies could be calculated.

(2 marks) **a.** Describe in words the relation between the number of copies and the charge.

____

____

(2 marks) **b.** Write the relation in function notation.

(2 marks) **c.** What is the charge for photocopying 10 copies? Show your work.

23. A group of friends decide to analyse the relation between their marks in physics and mathematics. Each student's marks in mathematics and physics are given in the table.

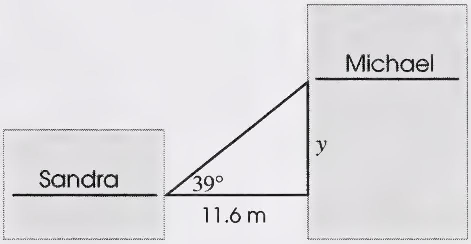
Mathematics Mark	Physics Mark
48	55
64	67
80	83
95	98
87	81
68	79

(2 marks) **a.** Use technology to determine the value of the correlation coefficient for the tabulated marks. Give your answer to the nearest hundredth.

(2 marks) **b.** Based on the correlation coefficient, predict how well the tabulated data will fit a straight line. Explain.

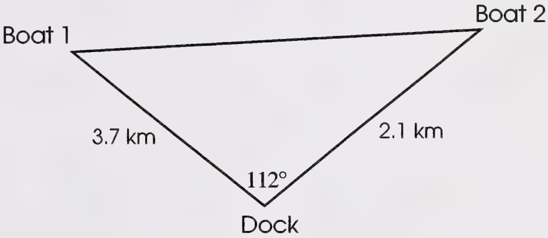
(2 marks) **c.** Use technology to check the prediction you made in part b. Make a sketch of the scatterplot and line of best fit.

(3 marks) **24.** Sandra lives in an apartment on the third floor of a seven-storey building. Sandra's friend Michael lives in a highrise building next to her building. Sandra determines the angle of elevation is 39° from her apartment to Michael's apartment, and the distance between the buildings is 11.6 m.

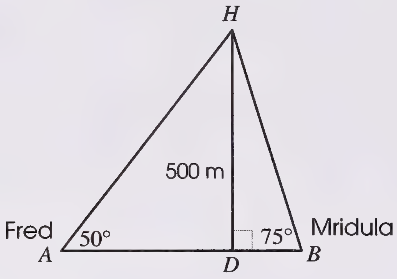


How much higher is Michael's apartment than Sandra's apartment? Give your answer to the nearest tenth of a metre.

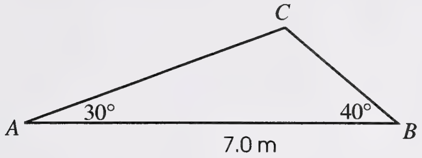
(3 marks) **25.** Two boats are 2.1 km and 3.7 km from a dock where Helmut is standing. Helmut determines the angle between the two boats to be 112°. Determine the distance between the two boats. Round the answer to the nearest tenth of a metre. **Note:** The given diagram is **not** drawn to scale.



(4 marks) **26.** Fred and Mridula were surveying along a straight road *AB* to find the location of a house 500 m from the north side of the road. Fred measures the angle to the house to be 50°; Mridula measures the angle to the house to be 75°. How far apart, to the nearest metre, are Fred and Mridula?



27. James is building a greenhouse. To maximize the amount of sunshine entering the building, James constructs the roof as illustrated.



(1 mark)

a. Determine the measure of $\angle C$ to the nearest degree.

(4 marks)

b. Determine the lengths of the roof trusses, AC and BC, to the nearest 0.1 m.

TEACHER QUESTIONNAIRE FOR APPLIED MATHEMATICS 10
(© 2000)

This course is designed in a new distance learning format, so we are interested in your responses. Your constructive comments will be greatly appreciated, as future course revisions can then incorporate any necessary improvements.

Teacher's Name ________________________ Area of Expertise ________________________

School Name ________________________ Date ________________________

Design

1. The modules follow a definite systematic design. Did you find it easy to follow?

   ☐ Yes ☐ No If no, explain.

   ____

   ____

2. Did your observations reveal that the students found the design easy to follow?

   ☐ Yes ☐ No If no, explain.

   ____

   ____

3. Did you find the Teacher's Guide helpful?

   ☐ Yes ☐ No If no, explain.

   ____

   ____

4. Part of the design involves stating the objectives in student terms. Did you find this helped the students understand what they were going to learn?

   ☐ Yes ☐ No If no, explain.

   ____

   ____

5. The Teacher's Guide contains answers to the questions in the Assignment Booklets and Project Booklets, and it includes a sample test. Did you find these helpful?

☐ Yes ☐ No If no, explain.

____

____

6. Did the Follow-up Activities prove to be helpful?

☐ Yes ☐ No If no, explain.

____

____

7. Were students motivated to try these Follow-up Activities?

☐ Yes ☐ No If no, give details.

____

____

8. Suggestions for computer and video activities may be included in the course. Were your students able to use these activities?

☐ Yes ☐ No Comment on the lines below.

____

____

9. Were the assignments appropriate?

☐ Yes ☐ No If no, give details.

____

____

10. Did you fax assignments? ☐ Yes ☐ No

11. If you did fax, did you get satisfactory results from using this procedure?

☐ Yes ☐ No If no, give details.

____

____

Instruction

1. Did you find the instruction clear?

☐ Yes ☐ No If no, give details.

2. Did your observations reveal that the students found the instruction interesting?

☐ Yes ☐ No If no, give details.

3. Did you find the instruction adequate?

☐ Yes ☐ No If no, give details.

4. Was the reading level appropriate?

☐ Yes ☐ No If no, give details.

5. Was the workload adequate?

☐ Yes ☐ No If no, give details.

6. Was the content accurate and current?

☐ Yes ☐ No If no, give details.

7. Did the content flow consistently and logically?

☐ Yes ☐ No If no, give details.

8. Was the transition between booklets smooth?

☐ Yes ☐ No If no, give details.

9. Was the transition between print and media smooth?

☐ Yes ☐ No If no, give details.

Additional Comments

Thanks for taking the time to complete this questionnaire. Your feedback is important to us. Please return this questionnaire to the address on the right.

Fax Number: (780) 674-6561

Instructional Design and Development
Learning Technologies Branch
Box 4000
Barrhead, Alberta
T7N 1P4

Note: Please ensure that each of your students has completed and forwarded a copy of the Course Survey.

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Mathematics 10
Teacher's Guide
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